



THE MATTER WITH THINGS

Our Brains, Our Delusions,
and the Unmaking of the World
IAIN MCGILCHRIST
• VOLUME I •

THE MATTER WITH THINGS

OUR BRAINS, OUR DELUSIONS AND THE UNMAKING OF
THE WORLD

IAIN MCGILCHRIST

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***The Matter With Things:
Our Brains, Our Delusions and the Unmaking of the World***

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A NOTE TO THE READER

THE ARGUMENT

This book is what would conventionally be called a single argument. That is why I have chosen not to publish it as three separate books: one on neuropsychology – how our brains shape reality; one on epistemology – how we can come to know anything at all; and one on metaphysics – the nature of what we find in the cosmos. It is intended as a single whole, each part illuminating, and in turn illumined by, the others.

And yet it is also not an argument, in the conventional sense, at all. If we want others to understand the beauty of a landscape with which they may be unfamiliar, an argument is pointless: instead we must take them there and explore it with them, walking on the hills and mountains, pausing as new vantage points continually open around us, allowing our companions to experience it for themselves.

Such, at any rate, is my intention in this book. The journey matters – because it *is* the arrival. This means that while, for some, every succeeding view will disclose some new aspect of an always changing landscape with which at every turn they become better acquainted, for others the landscape will appear to be, unrewardingly, always the same landscape.

Importantly, this also means that the reader must *not* feel that the whole book has either to be read in its entirety or not at all. Continuing the analogy of a journey, it can be taken in (I hope) enjoyable stages; and can be put down and picked up, or explored according to whim. My hope is that my reader will end by reading much of it anyway, but do so in a spirit of an intellectual friendship, not as another challenge to fit in to a busy life.

At one point I was going to call this book *There Are No Things*. I changed my mind when I saw that it might align me with a nihilistic trend in post-modernism that I deplore. It also gave the impression that I was arguing for ‘truth-as-correctness’ rather than ‘truth-as-unconcealing’. My aim is to clear away the assumptions that cloud our vision: and the assumption of a materialist world composed of ‘things’ is the greatest impediment we face. In an obvious sense, there are things: my hope is that the reader will not abandon them, but reconceive them in a richer way. In summary, my trust is in my readers, that for them something deeper will be

unconcealed, and that they will literally *dis*-cover a new vision of the world for themselves.

REFERENCES

I apologise for the number of references. If I were merely relaying the conventional dogmas of neuroscience, they would hardly be necessary: but I am not, and so they are. I very much hope that this book, large as it is, will be read by the widest possible audience of intelligent general readers. I have therefore taken care that no specialist knowledge is assumed. At the same time, I aim to make a modest, but I hope significant, contribution to neuroscience. This makes the presentation of a very large body of research evidence inevitable; that should not deter the non-specialist reader, who may feel free to pass over the detail, mainly contained in notes as far as possible next to the text to which they refer. For colleagues, I have tried to make references as easy as possible to track down. It can be frustrating to be referred (as now seems to be the norm) to a volume of a journal without being directed to the part, leaving one to guess which of, perhaps, 12 such parts to access; I have tried always to give the full necessary information, and, to save the reader's time, to indicate precise pages, where relevant, within a larger work. I have saved space by removing the conventionally supplied city in which a book is published: to know that Oxford University Press is based in 'Oxford, UK' is hardly a revelation, and in today's world where a publisher claims to be based is largely irrelevant.

TRANSLATIONS

In the book there are many translated passages, sometimes from sources that have not been translated, or might have been better translated, into English. In this I hope to have made a small contribution to future scholarship in the area. Unless the reader is referred in the notes to a particular English translation as the source, all translations may be assumed to be by myself. To avoid repetition, I have omitted reminders of this fact. Where possible, if using another's translation, I have consulted the original; and where I rely on my own translation, I have generally given the original, so that those more adept than I can judge for themselves.

The problem of neurology is to understand man himself.

—*Wilder Penfield* ¹

ἡμεῖς δέ – τίνες δὲ ἡμεῖς;
But we – who *are* we?

—*Plotinus* ²

INTRODUCTION

Yes, a key can lie for ever in the place where the locksmith left it,
and never be used to open the lock the master forged it for.

—Ludwig Wittgenstein [1](#)

This book is an attempt to convey a way of looking at the world quite different from the one that has largely dominated the West for at least three hundred and fifty years – some would say as long as two thousand years. I believe we have systematically misunderstood the nature of reality, and chosen to ignore, or silence, the minority of voices that have intuited as much and consistently maintained that this is the case. Now we have reached the point where there is an urgent need to transform both how we think of the world and what we make of ourselves; attempting to convey such a richer insight is the ambition of this book.

We have been seriously misled, I believe, because we have depended on that aspect of our brains that is most adept at manipulating the world in order to bend it to our purposes. The brain is, importantly, divided into two hemispheres: you could say, to sum up a vastly complex matter in a phrase, that the brain's left hemisphere is designed to help us *ap*-prehend – and thus manipulate – the world; the right hemisphere to *com*-prehend it – see it all for what it is. The problem is that the very brain mechanisms which succeed in simplifying the world so as to subject it to our control militate against a true understanding of it. Meanwhile, compounding the problem, we take the success we have in manipulating it as proof that we understand it. But that

is a logical error: to exert power over something requires us only to know what happens when we pull the levers, press the button, or utter the spell. The fallacy is memorialised in the myth of the sorcerer's apprentice.² It is hardly surprising, therefore, that while we have succeeded in coercing the world to our will to an extent unimaginable even a few generations ago, we have at the same time wrought havoc on that world precisely because we have not understood it.

This book, then, is about the nature of reality. It's about how we are equipped by our brains to try to understand it, and what we can learn from that. It's about the approaches that are available to us to gain an understanding of reality, given that equipment. It attempts, consequently, to give an account of reality that seems truer to the evidence than the one to which we have long been accustomed; one that is far-reaching in its scope, and consistent across the realms of contemporary neurology, philosophy and physics.

And from that follows an account of who *we are*, on which nothing less than our future depends.

What in particular I offer here is a new synthesis of philosophy and science which I believe is importantly, and excitingly, liberating to both parties. As a rule, philosophy and science go on as if the other did not exist. Scientists tend to see philosophy as a luxury they can't afford to get involved with, a ball and chain that will slow them down in their race for the next discovery; philosophers to see science as somewhat beneath them, and in any case irrelevant to the ponderings of the mind on itself. But as the great physicist Erwin Schrödinger put it in *Science & Humanism*,

it seems plain and self-evident, yet it needs to be said: the isolated knowledge obtained by a group of specialists in a narrow field has in itself no value whatsoever, but only in its synthesis with all the rest of knowledge and only inasmuch as it really contributes in this synthesis toward answering the demand, τίνας δὲ ἡμεῖς; 'Who are we?'³

Here Schrödinger is remembering Plotinus, one of the greatest of Greek philosophers; but his point is of a contemporary relevance that it is impossible to overstate.

Seventy years on from Schrödinger's pronouncement, specialisation makes it even harder to expect more than a tiny handful of scientists and philosophers to be in a position to venture into a genuinely new understanding of their (in reality) common enterprise, one that has the potential hugely to enrich both parties. When any attempt is made to reach out a hand across the distancing void, it is almost invariably an exercise in reinforcing the status quo: the scientists telling the philosophers that they find only machinery, and the philosophers reflecting back to the scientists that a mechanistic view is the best option on offer. Since what you find is a product of how you attend, this is a more or less pointless exercise in making sure that both parties sink to the bottom in the shortest possible time.

Philosophy is engaged in weighing evidence so as to decide between conflicting ways of understanding the world, each of which has something to be said for it. This is why philosophy never ends. But what if, among the evidence, there were some way of recognising a particular take on the world as – not just floating in a contextual void, but rather – the predictable result of paying a quite particular kind of attention to the world? And what if we happened to know a great deal about the evolutionary purposes, and the consequences, of such a way of attending, including what weight we should attach to its findings?

And what if such insights, gained from science, and explicated by philosophy, could be applied in turn to the science of mind itself? Then might we not begin to see a fertile symbiosis of philosophy and science, helping one another, each turn building on the next, to rise to a new, more truthful vision of who, indeed, *we are*?

RE-THINKING SOME ASSUMPTIONS

At the core of the contemporary world is the reductionist view that we are – nature is – the earth is – ‘nothing but’ a bundle of senseless particles, pointlessly, helplessly, mindlessly, colliding in a predictable fashion, whose existence is purely material, and whose only value is utility. Neither Plotinus nor Schrödinger would have been impressed. I cannot remember a time when I thought this sounded at all convincing; and a lifetime’s thinking and learning has done nothing to allay my scepticism. Not only is it mistaken, I believe, but actively damaging – physically, to the natural world; and psychologically, morally, and spiritually to ourselves as part of that world. It endangers everything that we should value.

Reductionism can mean a number of things, but here I mean quite simply the outlook that assumes that the only way to understand the nature of anything we experience is by looking at the parts of which it appears to be made, and building up from there. By contrast I believe that the whole is never the same as the sum of its ‘parts’, and that, except in the case of machines, there are in fact no ‘parts’ as such, but that they are an artefact of a certain way of looking at the world. For this reason it is every bit as true that what we call the parts can be understood only by understanding the whole to which they belong. And with the reductionist outlook goes determinism, the belief that if we knew enough about the position and momentum of every particle in the universe we could predict everything that happens from here on in, including your every thought, desire and belief.

Even if contemporary physics did not demonstrate that this is an impossibility, there is a problem with this kind of argument. Reductionists and determinists unerringly fail to take account of the fact that their own arguments apply to themselves. If my beliefs are ‘nothing but’ the mechanical products of a blind system, so are all views, including those of the reductionist. If everything is already determined, the determinist’s tendency to embrace determinism is also merely determined, and we have no reason to take it seriously (since we are all determined either to believe it or not already). As the philosopher Hans Jonas observed, there is an unspoken hierarchical principle involved:

the scientist does take man to be determined by causal laws – but not himself while he assumes and exercises his freedom of enquiry and his openness to reason, evidence and truth. His own working assumptions involve free will, deliberation, and evaluation as aspects of himself, but those qualities and capacities are stripped away from and denied to the human object or thing that he is inspecting... ⁴

If it were not for the fact that this world-picture is mistaken, you might argue that we ought, nonetheless, to ‘man up’ and accept it. But it *is*, as I hope to demonstrate, massively mistaken. My aim is to show the reader the magnitude of the error, and its consequences. I say ‘show’, because I cannot, any more than anyone else, prove anything finally and irrefutably – the material with which we are dealing makes that impossible; but rather I wish to take my reader by degrees to a new vantage point, one built upon science and philosophy, from which, in all likelihood, the view will appear at the same time unfamiliar, and yet in no way alien – indeed rather the opposite. More like a home-coming. From there the reader must, of course, make up his mind for himself.

‘To put the matter in a nutshell’, wrote the philosopher Friedrich Waismann,

a philosophical argument does more and does less than a logical one: less in that it never establishes anything conclusively; more in that, if successful, it is not content to establish just one isolated point of truth, but effects a change in our whole mental outlook so that, as a result of that, myriads of such little points are brought into view or turned out of sight, as the case may be.⁵

Such a whole shift of view, rather than the adjustment of a few points within a familiar landscape, is what I hope for my reader.

And that process must begin with the very idea of *things*. ‘The world is not just a set of separately existing localized objects, externally related only by space and time’, writes Tim Maudlin, Professor of Philosophy and Physics at NYU. ‘Something deeper, and more mysterious, knits together the fabric of the world.’⁶ Indeed, according to Richard Conn Henry,

Professor of Physics and Astronomy at Johns Hopkins, ‘to see the Universe as it really is, we must abandon our tendency to conceptualize observations as things’.⁷

Reductionism envisages a universe of *things* – and simply material things at that. How these things are related is viewed as a secondary matter. However, I suggest that relationships are primary, more foundational than the things related: that the relationships don’t just ‘connect’ pre-existing things, but modify what we mean by the ‘things’, which in turn modify everything else they are in relationship with. That is because what we are dealing with are, ultimately, relations, events, processes; ‘things’ is a useful shorthand for those elements, congealed in the flow of experience, that emerge secondarily from, and attract our attention in, a primary web of interconnexions. I have nothing against things, provided we don’t see them as primary.

In our ordinary way of thinking, things must be established before there can be relationships, and so this about-turn should seem paradoxical; but as I shall explain, paradox very often represents a conflict between the different ‘takes’ afforded by the two hemispheres. However, we must also be prepared to find that, as Niels Bohr recognised, whereas trivial truths manifestly exclude their opposites, the most profound truths do not. This is itself a version of the realisation that what applies at the local level does not necessarily apply in the same way at the global level. The failure to observe this principle underlies some of the current misconceptions of both science and philosophy.

I believe that nowadays we live no longer in the presence of the world, but rather in a re-presentation of it. The significance of that is that the left hemisphere’s task is to ‘re-present’ what first ‘presences’ to the right hemisphere. This re-presentation has all the qualities of a virtual image: an infinitely thin, immobile, fragment of a vast, seamless, living, ever-flowing whole. From a standpoint within the representation, everything is reversed. Instead of seeing what is truly present as primary, and the representation as a necessarily diminished derivative of it, we see reality as merely a special case of our representation – one in which something is added in to ‘animate’ it. In this it is like a ciné film that consists of countless static slices requiring a projector to bring it back into what at least looks to us like a living flow. On the contrary, however, reality is not an animated version of our re-presentation of it, but our re-presentation a devitalised version of

reality. It is the re-presentation that is a special, wholly atypical and imaginary, case of what is truly present, as the filmstrip is of life – the re-presentation is simply what one might call the ‘limit case’ of what is real. Stepping out of this world-picture and into the world, stepping out of suspended animation and back into life, will involve inverting many of our perhaps cherished assumptions.

This concept of the limit case is one I will recur to. I am using it to mean that what is essential to the phenomenon has in this case reached its minimum, without being actually extinguished. It should not be taken as typical, but as the very opposite. Thus, reverting to the example of relationships and the ‘things related’, relationship is the norm; isolation, if it could ever be wholly achieved (which it cannot), would be the limit case of interrelation. Or again, to continue the image of the ciné film: in the Newtonian universe, the natural state of any ‘thing’ is stasis. According to Newtonianism, motion is an aberration from this primal state of perfect inertia, requiring the equivalent of the projector (some energy conceived as *added from outside*) to set it going. However, nothing we know is in reality ever entirely static; and relative stasis, not motion, is the unusual circumstance that requires explanation. Stasis is, in other words, the limit case of motion, in which it approaches, but never completely reaches, zero. Motion, then, is not an unusual departure from stasis, but stasis an unachievable imaginary state, which in reality can be approached only as an asymptote.

Let me give a few further examples, which I grant may seem at first sight surprising, even nonsensical. We could start with our own thought processes and their expression in language. The explicit is not more fully real than the implicit. It is merely the limit case of the implicit, with much of its vital meaning sheared off: narrowed down and ‘finalised’. The literal is not more real than the metaphorical: it is merely the limit case of the metaphorical, in which the wealth of meaning is collapsed into a 1:1 correspondence for a useful, temporary, purpose.

More importantly, it’s the wider cosmos whose deep structure we are inclined to misunderstand. It may seem obvious that randomness is the primary condition and that order is an unusual phenomenon that emerges from (how?), and is supervenient on, that primary chaos. However, order is not a special case of randomness, but randomness merely the limit case of

order, which is the universal norm. Indeed, true randomness is a theoretical construct that does not exist.

Complexity and simplicity are relative terms. However, complexity is surely, we imagine, a more unusual state of affairs arising out of the agglomeration of more simple elements – isn't it? I believe that this is a mistake – one all too understandable, given our world view, but a mistake nonetheless. Rather, complexity is the norm, and simplicity represents a special case of complexity, achieved by cleaving off and disregarding almost all of the vast reality that surrounds whatever it is we are for the moment modelling as simple (simplicity is a feature of our model, not of the reality that is modelled). In keeping with this – and, don't worry, right now this *should* seem crazy – inanimacy is better regarded as the limit case of animacy, something I will come to later in the book.

Potential is not simply all the things that never happened, a ghostly penumbra around the actual. The actual is the limit case of the potential, which is equally real; the one into which it collapses out of the many, as the particle is the collapse of a quantum field. (The particle is not more real than the field, rather it is a special case of the field, in which its field-like characteristics are at a minimum.) Similarly, the wholly determinate, were it to exist, which it does not, would be the limit case of the indeterminate.

Straight lines, in as much as they can be said to exist at all, do so as the limit case of curves, which constitute all the lines in nature (even space and the paths travelled in it are curved). Linearity is the limit case of nonlinearity, and can be approximated only by taking ever narrower views of an infinitely complex picture. The discontinuous, in as much as it can be said to exist at all, is the limit case of the continuous, which is the norm. Total independence is an imaginary construct, the limit case of *interdependence*, which is universal.

And the whole is shot through with purpose (a notion, by the way, that has nothing to do with some sort of engineering God), and endlessly creative, not pointless and passive. This cosmos is one from which we are never separate, but out of which we arise, in which we dwell, and to which, finally, we return.

My ultimate aim is to contribute a new perspective from which to look at the fundamental 'building blocks', as we think of them, of the cosmos: time, space, depth, motion, matter, consciousness, uniqueness, beauty, goodness, truth, purpose and the very idea of the existence or otherwise of a

God. These will form the subject of the last part of the book. Of course, these are vast topics, ones that have been grappled with by the ablest human minds for millennia; naturally I don't presume to try to settle the disputes that have arisen. Moreover, I am very far from being the first person to argue that the prevailing view is badly mistaken. But I do believe that the hemisphere hypothesis casts a very revealing new light on those disputes and strongly suggests that the view that has prevailed – a view heavily indebted to a belief in reductionism – very seriously distorts the evidence of the nature of reality that is before our eyes if only we would attend to it fully. It provides a genuinely new and compelling context in which to revisit these issues, one that may encourage us toward very different conclusions.

At the end of the book I shall return to considering the possible relevance of all this to the crises the world so palpably faces and to the condition of our own culture in the West. By then, though, I hope the relevance will have become all too obvious to the reader through following the argument of the book.

A BRIEF CLARIFICATION

Before I go any further, I am going to offer some indications towards an important aspect of the philosophical position I have come to espouse, and which I will advocate in this book. It is one that has arisen slowly through reflections on experience, and, in a way, I would rather have left an expression of it to emerge more slowly and organically out of what I will be going on to discuss. But I think that without some preliminary statement, however brief, the reader might jump to erroneous conclusions which may ultimately make it harder to see the fuller picture when we arrive there. I hope that questions I raise without addressing them immediately here will be found to be addressed in due course: my position will become much clearer as the book unfolds. These are my first words, by no means my last.

I wish, at this stage, to do little more than clearly distance myself from two positions. In the last century or so, there has been a tendency, at least in popular discourse, to pull reality in opposing directions. Some scientists, whether they put it this way or not when they are asked to reflect, still carry on as if there just exists a Reality Out There (ROT), the nature of which is independent of any consciousness of it: naïve realism. These are usually biologists; you won't find many physicists who would think that. In reality, we participate in the knowing: there is no 'view from nowhere'. Of crucial importance is that this fact does *not in any way* prevent science legitimately speaking of truths – far from it; a point I will return to in subsequent chapters. We desperately need what science can tell us, and postmodern attempts to undermine it should be vigorously resisted. Two important truths, then: science cannot tell us everything; but what science *can* tell us is pure gold. Any attempt to suppress science (I distinguish science sharply from technology), for whatever reason, is dangerous and wrong.

Meanwhile, on the other hand, there are philosophers of the humanities who think that there is no such thing as reality, since it's all Made Up Miraculously By Ourselves (MUMBO): naïve idealism. Such people, by the way, never behave as though there was no reality. Nor of course, by its own logic, can they claim any truth for their position.

These viewpoints are closer than they look. One party fears that if what we call reality were in any sense contaminated by our own involvement in

bringing it about it would no longer be worthy of being called real. The other fears that, since we manifestly do play a part in its coming about, it's already the case that it can't be called real. But just because we *participate* in reality doesn't mean we invent it out of nowhere, or solipsistically project it on some inner mental screen; much less does it mean that the very idea of reality is thereby invalidated.

I take it that there is something that is not just the contents of my mind – that, for example, you, my reader, exist. There is an infinitely vast, complex, multifaceted, whatever-it-is-that-exists-apart-from-ourselves. The only world that any of us can know, then, is what comes into being in the never-ending encounter *between* us and this whatever-it-is. What is more, I will claim that both parties evolve and are changed through the encounter: it is how we and it become more fully what we are. The process is both reciprocal and creative. Think of it as like a true and close relationship between two conscious beings: neither is of course 'made up' by the other, but both are to some extent, perhaps to a great extent, 'made' what they are through their relationship. If this seems at this point a step too far, the reader can, I hope, embrace a weaker position, that at least, as I say, our world is what comes into being in the encounter *between* us *and* this whatever-it-is.

The relationship comes before the *relata* – the 'things' that are supposed to be related. What we mean by the word 'and' is not just additive, but *creative*.

There is no one absolute truth about the world that results from this process, but there are certainly truths: some things we believe will be truer than others. A maximally open, patient, and attentive response to whatever-it-is is better at disclosing or discerning reality than a response that is peremptory, insensitive, or – above all – shrouded in dogma.

Importantly, what we experience is not just an *image* of a world 'outside', some sort of projection on the walls of a Cartesian theatre inside our heads, and watched by an intracerebral homunculus on an intracerebral sofa. As I will explain, such a viewpoint could be predicted to arise from the left hemisphere's attempt to deal with a reality it does not understand, and for which everything is a representation. True, we can deceive ourselves by mistaking our own projections for reality – and we often do; but that does not entail that we are always victims of self-deception. When we are properly attentive, what we experience is the 'real deal', though it be

only a tiny part of all that is. To appreciate that, you need the right hemisphere – and preferably, of course, both hemispheres – to be in play. It is true that we can see the world only partially, but we still each see the world directly. It is not a *re*-presentation, but a real *presence*: there is not a wall between us and the world. Our experience is *of whatever-it-is* and not another thing, even if we can't get away from the fact that it is we who experience it.

Yet, I say, we take part in its creation. How can that be?

An analogy may help get closer to what I mean. There is such a 'thing' as Mozart's G minor quintet. It is in a way quite specific. It certainly is not a fantasy, and it cannot be made up by me any way I want it. However, it doesn't exist in the closed score on my bookshelf (the potential alone is there). It doesn't exist in Mozart's mind, either, because he's dead, and the moment when he died made no difference whatever to the existence or the nature of the quintet. And there isn't a single *ideal* quintet that we are always imperfectly imitating in our encounters with it. It keeps coming into being, it keeps *becoming*, each time a mind, with all its history and preconceptions, encounters it, or when many minds do so together. Each time it will be real. And each time it will also be different, although it will be recognisably the 'same' piece of music. It is certainly not a matter of 'anything goes'. Not every rendition will be equally good, or equally true to the spirit of the quintet. And saying so should not be a problem: in life we don't find it difficult to discriminate between better or worse performances, and, crucially, we expect at least a degree of consensus on the matter among those who know enough to recognise a good performance when they hear one.

However, no-one would expect me to say precisely how I know that it is a 'true' performance of the work, let alone to prove to them that it is. At best I could point to certain aspects of the performance, and hope my fellow-listener picks up. And that's not just because of the particular nature of music. No-one expects me to say how I know that my understanding of *Hamlet* is more or less true, either. As a critic of *Hamlet* I state what I see: people either 'click' with what I say – get an insight from it – or don't. They either feel that I (and now they) know more about *Hamlet*, or they don't. This is not to give a single crumb of comfort to the 'my view is as good as yours' types. There are, very clearly, better and worse interpretations. I could get it indisputably wrong, for example, by claiming

it is really an account of peasant life in Azerbaijan in the tenth century, or, less dramatically, but nonetheless clearly, by claiming that it is primarily a critique of James I's foreign policy. There are in fact an almost limitless number of ways in which I am free to get it wrong.

I believe philosophy is like that. With the best will in the world, on both sides, I can't *make* you see what I experience as the truth. I can never convince you of a point of view unless you already, at some level, get it. As Friedrich Waismann put it,

We cannot constrain anyone who is unwilling to follow the new direction of a question; we can only extend the field of vision of the asker, loosen his prejudices, guide his gaze in a new direction: but all this can be achieved only with his consent.⁸

We can't make a plant from a seed; we can, however, choose to stunt it or permit it to flourish. I want to permit something that I believe is already there in the reader to flourish. Philosophy may at times aspire to be, but cannot ever be, coercive: it cannot compel to a point of view. It can only allow an insight to dawn. Sometimes this can happen quite suddenly: I hope that will be the experience of at least a few of my readers. Plato described the process as a spark that crosses the gap: 'suddenly a light, as it were, is kindled in one soul by a flame that leaps to it from another'.⁹ The truth is not arrived at ultimately by argument alone, though discussion plays a valuable role along the way in dispelling misconceptions (if it didn't, I would hardly have bothered writing a long book): in the end every individual must choose what carries conviction, commands allegiance. The experience of understanding involves a shift from what seems initially chaotic or formless, to a coherent stable form or picture, a *Gestalt* – or from an existing *Gestalt* to a new and better one, that seems richer than the one it replaces.

The idea of a *Gestalt* is central to this book: by it I mean the form of a whole that cannot be reduced to parts without the loss of something essential to its nature. Indeed, what I hope to offer in this book is just such a *Gestalt* – one that is based on an understanding of the import of the structure of our brains.

The flow of the universe is always creative, though it has order, and is not random or chaotic; the world is always a matter of responsiveness, though it is equally not a free-for-all. It is a process of creative collaboration, of co-creation.

In that spirit, I now want to modify my image of the quintet, which corresponds to some, but not all, aspects of reality. What if the music is not Mozart, but something more like some sublime jazz, or an Indian *raga* or Portuguese *fado*? Something we improvise – within bounds. Whatever it is will emerge from a balance of freedom and constraint. It won't exist until it is being performed: no-one can know exactly what it will be like. But it will not be random: it will emerge from the players' continuous interaction, and from the music's own 'history' as it unfolds; what comes next will be anticipated by what has gone before. It will also be moulded by the imagination, skill and training we bring, our past experience of playing (together and apart), the conventions of certain traditions, and shared expectations, quite apart from the fundamental laws of acoustics. Our co-creation of the music does not occur *ex nihilo*, and is not just a projection of ourselves. Yet we, and you, partake of its making, even if we are only listeners.

Our immersion in a culture of recorded music, in which we are passive and inert consumers, encourages us to think of music as a 'thing', separate from the hearer and the musicians who make it. Yet any performer who has had the experience of being taken up by the flow of either music or dance, of being 'in the groove', knows this is a dreadfully reductive account. To be in the groove, in the *flow*, is to feel oneself *played by*, as much as playing, the music. As Yeats says, 'How can we know the dancer from the dance?' ¹⁰

Again, just because I use music as an example, I am not making a point specifically about music. Music happens to be a very clear case of how what we take to be a thing emerges from a complex of relationships, both those between notes and those between individual consciousnesses. But all our experience, not just in music but in life, both mental and physical, is of such a complex flow, a constantly unfolding, responsive dance of reciprocal gestures. It exists in process and in relationship; our taking part in that reciprocity does not leave us inhabiting a solipsistic fantasy, but, precisely, confirms that it is *not* a solipsistic fantasy. We interact with one another and the world at large in a myriad ways without being able to have more than

limited control of the outcome. What comes to be does so through an interaction of a multiplicity of elements, some ours, some not.

Whatever-it-is-that-exists-apart-from-ourselves creates us, but we also take part in creating whatever-it-is. By this I do not only mean the common sense view that I have an impact on the world, as the world has an impact on me: that I leave my footprints. That would lead immediately to the reflection that I am very small in relation to the world, and so effectively my impact is so small that for all intents and purposes it can be ignored. There is, it might seem, an inexpressibly vast universe and an inexpressibly tiny individual consciousness (I'd say that this is the left hemisphere's attempt to represent spatially and quantify something that is experiential and developed in time, but I hope that will be more comprehensible when we come to the discussion of time and space in Part III). Such a reflection seems to posit an *objective* position – the view outside of history or geography, time or space – a view from nowhere, in which all can be measured and compared. It implies a Measurer of all the measurers, measuring the other scales and putting each part in its place according to its overall worth. But though that cannot be, the alternative is not just a merely *subjective* position, either: this very polarity – subjective/objective – is misleading. In the *fado*, in the *raga*, in jazz, it is what it is because of me, and I am what I am because of it. I will have much more to say about the crucial issue of the subjective/objective 'divide' throughout this book.

Similarly whatever-it-is is potential until the encounter: in each authentic encounter – one in which the individual truly apprehends and is apprehended by this Other – the Other becomes fulfilled. Each time this comes about in a unique fashion; but one that is not alien to the coming into being of that Other as a whole. And the actualisation, which at first seems to be a narrowing or collapse of potential, positively *adds* to the now enlarged field of the potential, which only discovers itself through (the repetition of) such actualisations.

Within my experience of the world, very much can be changed by my response to whatever-it-is – in a sense everything can be changed. Though that may seem to be 'just for me', how big or small is that? We cannot weigh consciousness against the universe. It is like trying to say precisely how much you love someone, if you really love them. It is not fixable in space or quantitative, but qualitative and experienced in the living flow of time. And if things turn out to be interconnected, not atomistic – and they

are – each consciousness has its impact on the universe that cannot be quantified.¹¹

Does this mean that there is no such thing as being wrong? Of course not. Though there can be no rules for jazz – indeed if it merely followed rules it would no longer *be* jazz – there are many things that just can't be done; much as in the middle of a flamenco dance, whose form is not predetermined, one cannot suddenly start balancing on one's heels, or stop and scratch one's nose, or do the can-can, without the dance ceasing to be. Flamenco is more formalised than jazz, but even in jazz there is literally no end to the list of what one doesn't do. However, there's no recipe, no procedure or algorithm to follow, for getting it right, either.¹² An algorithm is what the left hemisphere wants; the recognition that it's got to be free of any algorithm, yet not at all random, is characteristic of the understanding of the right hemisphere. We can specify what is not jazz, but not what is. Our knowledge of anything unique is similarly apophatic.

Just as 'and' is not merely additive, 'not' is not merely negative. Both are creative. Indeed resistance – 'not-ness' – is an absolute necessity for creation, another apparent paradox that will become clearer as this book unfolds.

That of which I have no inkling – whatever I just don't 'get' or 'see' – does not exist for me. That manifestation of whatever-it-is is simply not available in my world. But this doesn't mean that things come and go from everyone else's reality dependent on my understanding of it. If I can't see the moon, that doesn't mean it stops being there for others. If we are all tuned in to the same whatever-it-is – and I believe it makes no sense to assert we are not – something very like what I can't see is probably being seen by others, and ultimately that will affect me. It is perfectly possible to be deceived about, or to be in denial about, an aspect of whatever-it-is.

As I hope to demonstrate, there is much evidence that the left hemisphere is less veridical, more ready to embrace denial and more likely to be taken in by an illusion than the right. For that to be the case, there has to be some test of reality. Truth certainly has a meaning – I shall explore this explicitly in Chapter 10, which is devoted to the question. But truth, like reality, is an encounter. It is in the nature of an encounter that more than one element is involved. And what *I* find in whatever-it-is does not pre-exist my encounter with it. There must be a potential, true enough, but it is actualised only in my encounter with it. The encounter is genuinely

creative. The whole universe is constantly creative – but not out of nowhere.

We are dealing here with a phenomenon or process whose shape can be intuited, but to which our everyday language is not well adapted. When the world is viewed as a flow, albeit a differentiated one, rather than as a succession of points or a world of *things*, these problematic formulations can be approached from a fresh point of view, wherein many of the difficulties get to be resolved. But that is to jump ahead. For now, I will simply say that I hope that in what follows the reader may come to see grounds for a view that the world is a seamless, always self-creating, self-individuating, and simultaneously self-uniting, flow that is only truly knowable as it comes to be known. (I say ‘it’, for convenience at this point; it is a question worth considering whether this is the appropriate pronoun.) ‘It’ is like a stream, with its whirlpools and eddies, that come into being for a time, and resolve; while they are there they are present to all observers, even measurable up to a point; and yet, while distinct, they are inseparable from the stream, not just in the sense that without the stream they do not exist, but in the sense that they *are* the stream. And creativity is always discovery of the self as well as of the other.¹³ Once one sees this, the objectivising, time-denying, change-denying, diagrammatic mentality of modern Western thinking appears as I believe it is: a hindrance, not a help, on the path to truth.

The world we know cannot be wholly mind-independent, and it cannot be wholly mind-dependent. Once again, this leaves no room for a philosophy of ‘anything goes’. What is required is an attentive response to something real and other than ourselves, of which we have only inklings at first, but which comes more and more into being through our response to it – if we are truly responsive to it. We nurture it into being; or not. In this it has something of the structure of love.

Where this leads will, I hope, be clearer by the end of the book, when I will return to its implications. As I say, I have reservations about the usefulness of such a statement as I have given at this stage. It is rather like trying to convey the ‘meaning’ of a novel or a film by a couple of sentences outlining the plot in advance. The very people for whom this excursus was designed are the same ones at risk of getting too hung up on the detail of terminology, rather than seeing what is being pointed towards. That can only be recognised, not defined: in this it is like the Zen image of the

philosopher pointing at the moon, while those around him are focussed on his finger. If I may borrow the words of Fichte:

I have sought so far as possible to avoid a fixed terminology – the easiest way for literalists to deprive a system of life, and make dry bones of it ... It will be necessary first to obtain a view of the whole before any single proposition therein can be accurately defined, for it is their interconnection that throws light on the parts; a method which certainly assumes willingness to do the system justice, and not the intention of merely finding fault with it.¹⁴

Once again, the whole illuminates the parts as much as the parts can illuminate the whole. To the left hemisphere, you find the truth about something by building it up from bits. But, as the right hemisphere is aware, to *understand* it you need to experience it as a whole, since the whole reveals as much about the nature of the parts as the parts do about the nature of the whole.

This clarification was necessary, because I will be explaining that the world we experience – which is the only one we can know – is affected by the kind of attention we pay to it. This implies that there is no simple and single, wholly mind-independent, truth. What I did *not* want to appear to be saying, at any cost, was that there is no such thing as truth; or that reality is simply made up at our whim. Absolutely not.

ATTENTION AND THE BRAIN

Attention changes the world. How you attend to it changes what it is you find there. What you find then governs the kind of attention you will think it appropriate to pay in the future. And so it is that the world you recognise (which will not be *exactly* the same as my world) is ‘firmed up’ – and brought into being.

What, then, is attention? Is it really just another ‘cognitive function’ of that supposed ‘machine’, the brain? It’s clearly something pretty special if it takes part in the creation of the only world we can know. Is it a thing? Hardly. Is it something we do? Nearer, but not exactly. Perhaps a manner of doing? Or even a manner of *being*?

The best way I can put it is that it is the manner in which our consciousness is disposed towards whatever else exists. The choice we make of how we dispose our consciousness is the ultimate creative act: it renders the world what it is. It is, therefore, a moral act: it has consequences. ‘Love’, said the French philosopher Louis Lavelle, ‘is a pure attention to the existence of the other’.¹⁵

In *The Master and his Emissary: The Divided Brain and the Making of the Western World*, I aimed to dispel the unscientific fiction, popular at the time, that there was no significant difference between the hemispheres. This misconception was just as popular, and just as absurd, as any of the myths about supposed differences that were, and for all I know still are, being peddled in management seminars, and to which it was a knee-jerk reaction. In reality, as anyone who has worked with neurological and psychiatric patients knows, there is a world of difference between the two hemispheres: literally, since they give rise to two different *experiential worlds*. The question was not whether there was a difference – that was clear, beyond a shadow of a doubt – but *why* there was, and *of what kind* it might be.

My argument was, and is, that the nature of the difference between the hemispheres is far from anything hitherto imagined, and that it fulfils an evolutionary purpose of the utmost importance. It is not a separation of reason from emotion, or language from visuo-spatial skills, or any of the other things that used to be said, since, indeed, each hemisphere deals with absolutely everything – just in a reliably different way. The character and

sheer extent of that difference, as well as its significance for the future of our civilisation, formed the subject of that book. And that difference could be seen as rooted in a difference in attention, as I shall explain.

Many of the findings of neuroscience simply offer us a description of the brain correlates of human experience. For example, it is hardly a revelation that certain parts of the brain ‘light up’, as we say, on a scan, when we fall in love. Something has to, because every single experience you have has its correlates in the brain somewhere, and where exactly that may be does not tell us much about the experience of falling in love. As such, these and other similar findings offer a description of experience at a reduced level, but do not directly illuminate the nature of that experience. By contrast, my thesis, though it depends on neuroscience, has no reductionist agenda. I do not claim for an instant that our experience merely *is* some function in the brain. Quite the contrary, in fact, since my thesis implies that only one part of our brains – the part that understands less – would pursue such an agenda in the first place.

Some philosophers deny that scientific research can tell us anything at all about human experience, on the grounds that experience is an ‘inward’ matter (which is undeniably the case). By definition, or so it is said, our experience is the authority on what it itself is, and we cannot get a better handle on it by the approach from ‘outside’. Sympathetic as I am to this position, I cannot entirely agree. There are some aspects of our experience which, while perhaps not technically impossible to discover by introspection, are relatively opaque, since, for reasons of survival, nature has taken care to hide them from us. Too great an awareness of them would bring life to a standstill. But they may be nonetheless important for all that.

For example, take a look around you at the room in which you are sitting. Much of what you believe you are seeing is not actually seen at all, but is filled in at a level below conscious awareness on the expectation of familiarity. And we know this, not from introspection, but from neuropsychological research. There are many such aspects of what has been dubbed the ‘grand illusion’ that is our daily experience of the world, and ingenious experiments can sometimes bring them to light. Some of these experiments have become part of entertainment culture and are by now well known.¹⁶

Examining the brain, then, can sometimes add to our knowledge of what it means to be a human being, precisely because in some areas direct

knowledge from experience is providentially shielded from us. And there is one very important aspect of experience, right at its centre, that we are not aware of as experience unfolds, because awareness of it would bring life to a standstill. That is the fact that our experience is constantly synthesised from the divergent 'takes' on the world offered to us by each of our brain hemispheres.

SOME CORE IDEAS OF THE HEMISPHERE HYPOTHESIS

In one way, the hemisphere hypothesis is deceptively simple: the bi-hemispheric structure of the brain makes possible attending to the world simultaneously in two otherwise incompatible ways. It is the implications of this that are manifold. Immediately it gives rise to a number of further hypotheses: that this is a requirement of survival; that this difference underlies and makes sense of a host of observable cognitive and emotional differences that in its absence appear inexplicable and incoherent; that it underlies and makes sense of otherwise unexplained aspects of the relationship between the hemispheres, both structural and functional; that it explains the tension between phenomenologically different experiential worlds. And that that, in turn, helps to illuminate aspects of philosophy and psychopathology. In place of what hitherto looked like a myriad discrete pieces of information that one must accept with a shrug ‘just *are* that way’, there emerges a coherent picture that has meaning. When I refer to the hemisphere hypothesis from now on, I mean the whole of this set of hypotheses, and the overall picture they make possible.

Can all this be compressed into a few sentences? No, but I do understand the need to say *something*. So what follows is a crude summary, the best that can be hoped for in a short space, provided principally as a kind of aide-memoire to the reader of *The Master and his Emissary*, with no attempt here at nuance, or to argue a case, or adduce evidence.¹⁷ All that is taken care of in the book from which it derives.

In brief, then, a few questions; and then a few possible answers.

- The brain is asymmetrical in almost everything that can be measured, at many levels, in both its structure and function. Why?
- The power of the brain exists only through making connexions (between neurones) – and the reach of that power depends on the number of connexions it can make. Yet it is deeply divided down the middle. Why?
- The principal band of fibres that connects the two hemispheres at their base in humans, known as the corpus callosum, has got

proportionately smaller, not larger, over evolution – and is, in any case, to a large extent inhibitory in function. Why?

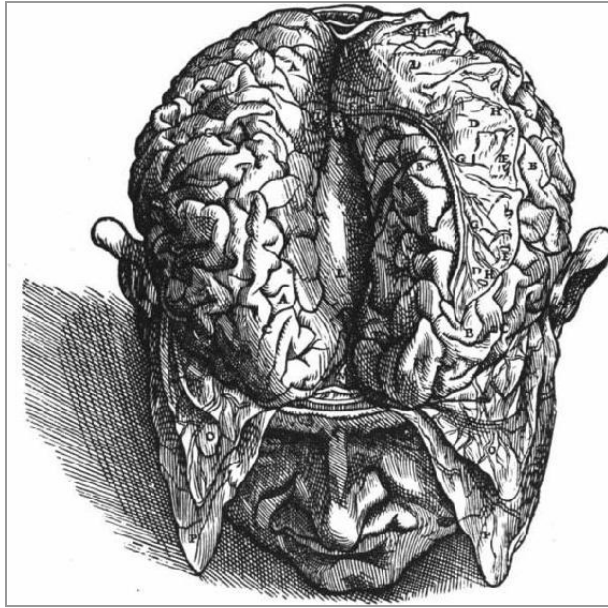


Fig. 1. Human brain, displaying the corpus callosum, from Andreas Vesalius, De humani corporis fabrica (1543): Book VII, Plate 3. The left hemisphere is retracted to display the corpus callosum ('L') in the midline, joining the two hemispheres at their base

The full answer to the last of these is, I believe, more complex, and even more intriguing, than the answer to the others, and it is a story I will turn to in Chapter 1. But there is one observation that lies behind the answer to all three questions, and makes perfect sense in Darwinian terms.

Every animal, in order to survive, has to solve a conundrum: how to eat without being eaten. It has to pay precisely focussed, narrow-beam attention that is already committed to whatever is of interest to it, so as to exploit the world for food and shelter. Put at its simplest, a bird must be able to distinguish a seed from the background of gravel on which it lies, and pick it up swiftly and accurately; similarly, with a twig to build a nest. Yet, if the bird is to survive, it must also, at one and the same time, pay another kind of attention to the world, which is the precise opposite of the first: broad, open, sustained, vigilant attention, on the lookout for predators or for conspecifics, for friend or foe, but also, crucially, open to the appearance of

the utterly unfamiliar – whatever may exist in the world of which it had no previous knowledge.

How on earth can you dispose your consciousness towards the world in two conflicting ways at once? The answer is the evolution of *two* neuronal masses, separate enough to function independently, but connected enough to work in concert with one another, each capable of sustaining consciousness on its own. In other words, a bipartite brain. Thus the need to sustain two incompatible ‘takes’ on the world simultaneously explains, I believe (and there is no significant competing theory), the extraordinary fact that the brain is so deeply divided, an otherwise inexplicable waste of potential in an organ that exists only to make connexions, and whose power lies, precisely, in the number of connexions it can make. And since the two halves have different roles, it makes sense that they are not mirror images of one another. Every single creature’s nervous system that we have studied is asymmetrical in nature, and where there is an identifiable brain it has this bipartite structure.

In birds and other animals studied, there is a highly significant separation of attention, with the left hemisphere being used largely for paying narrow-beam, sharply focussed attention to the world, for the purpose of manipulation, and the right hemisphere for paying open, sustained, vigilant attention to the world, in order to understand and relate to the bigger picture. The right is also the hemisphere with which creatures approach, appraise and ultimately bond with their mates.

At this stage I should point out to a reader new to the area that the right half of the brain controls and responds to the left half of the body, and vice versa. That means that motor and sensory function, as well as all manner of perception (except, oddly, for the sense of smell) from one half of space, both internal and external, is relayed to the opposite side of the body. Why this is the case throughout the vertebrate animal kingdom is not known for certain, though a number of possible explanations have been put forward.¹⁸ However, for the purposes of this book, nothing hangs on *why* it should be the case.

When it comes to the visual field, once again, in most animals, the left eye straightforwardly feeds information to the right hemisphere and vice versa, where the eyes are on the sides of the head. However, in humans the situation is slightly different, since we have eyes on the front of our heads. That means that the left visual field of *each* eye (both right and left) feeds to

the right hemisphere and, of course, the right visual field of *each* eye feeds to the left hemisphere (see Plate 1[d]).

The detail is not the important thing to remember. The point is that, very broadly, the right hemisphere *attends to* the left half of the world (in reality much more, but that can wait till Chapter 2), and the left hemisphere (pretty much solely) to the right half.

Attention is *not* just another ‘cognitive function’: it is, as I say, the disposition adopted by one’s consciousness towards the world. Absent, present, detached, engaged, alienated, empathic, broad or narrow, sustained or piecemeal, it therefore has the power to alter whatever it meets. Since our consciousness plays some part in what comes into being, the play of attention can both create and destroy, but it never leaves its object unchanged. So how you attend to something – or don’t attend to it – matters a very great deal.

By paying a certain kind of attention, you can humanise or dehumanise, cherish or strip of all value. By a kind of alienating, fragmenting and focal attention, you can reduce humanity – or art, sex, humour, or religion – to nothing. You can so alienate yourself from a poem that you stop seeing the poem at all, and instead come to see in its place just theories, messages and formal tropes; stop hearing the music and hear only tonalities and harmonic shifts; stop seeing the person and see only mechanisms – all because of the plane of attention. More than that, when such a state of affairs comes about, you are no longer aware that there is a problem at all. For you do not see what it is you cannot see.

Nothing ever comes to attention as an unformed percept: we always see something ‘as’ a something, whether we are aware of it or not.¹⁹ And that ‘as’ is always a partial truth with practical consequences for the encounter. For instance, there is no one way of ‘truly’ seeing the body. I have a different experience of what the human body is depending on whether the body is that of a patient, the victim in a crime I am investigating, my aunt, an artist’s model, or my lover. Each calls forth, and expects to receive, a different kind of attention, which governs what, in the end, it is that I experience.

Behind the house where I live there is a mountain whose description in Norse, *t-hallr skjær*, ‘the sloping rock’, is said to have given the place its name, Talisker. What this tells us is that, for the early Viking settlers in this remote part of the Scottish islands, the mountain was a valued landmark

clearly recognisable by its sloping outline from the sea. Still earlier, for the Picts whose ruined brochs show that they had lived in its shadow, it had meant both human shelter and the home of the gods; later, for eighteenth- and nineteenth-century travellers, it was a many-textured form of beauty to be engraved or painted; to the geologist, it is a notable example of columnar basalt formation; to a speculator it is a potential source of wealth; to a physicist it is 99.99% space, populated sparsely by particles of we know not what, that have only probabilistic existence there at all.

Which of these is the ‘real’ mountain? Each way of attending produces a mountain seen ‘as’ – something different. None of these ways can be said to be the ‘real’ way, for each is partial; and yet they are not illusory either. Neither is it ‘really just a lump of rock’, because that is, far from being an escape from subjectivity, to jump into it headlong. It is just another very partial way of seeing the mountain, the reductionist view: full of attitude, unexpressed goals and values – above all, that it is the only true view – and, while certainly seeing something, for most purposes leaving everything important out.

That attitude becomes particularly troublesome when one reaches the living, because here, too, there is a naïve assumption that the most reduced description is somehow the most real. We are really ‘just’ aggregates of cells, genes or particles, at whatever level of breakdown one likes to pause the analysis (it really doesn’t matter which, because there is always another level to go to on the way down to the *completely* unknown, at which point one has nothing and can say nothing: choose your own). The deception in this vanishing trick seems particularly hard to spot for those who pride themselves on their lack of self-deception.

The type of attention, then, is critical to what it is that one sees when one encounters the world. And encountering the brain is no exception. If one attends to it in one way, one sees a piece of machinery. If one attends in another, one sees part of a person. Crucial difference, for reasons I have already touched on. Ask the ‘machine’ question, and you find that each hemisphere is involved with ‘processing’ language, reason, music, emotion, imagery, morality, the self and much else besides. This could lead, and has led, people to say that there is no difference between the hemispheres. But each is involved with all these areas in a consistent, and consistently very different, way, as I demonstrated in *The Master and his Emissary*. It is not the what, but the how, that matters – as it does with the living person.

The right hemisphere is not just vigilant in a somewhat passive way. It is constantly engaged in both sustaining coherence in the world and actively scanning the world. What may in some cases later become a target for the left hemisphere's narrow focus will most probably have been first detected by the right hemisphere's broad search. Though, as the seconds pass, there is a tendency to shift towards more focal investigation of details initially revealed by the right hemisphere's overview – thus greater left hemisphere involvement – the search never becomes lateralised to the left.²⁰ And where a target is not obvious but needs to be actively searched out because, for example, it requires selecting something with more than one feature, this causes a large increase in activation of attentional areas predominantly in the right hemisphere.²¹ I will come to this in Chapter 2, but attention in general, and its nature, are more extensively underwritten by the right hemisphere than the left.

This distinction between narrow-beam, highly focussed attention in the left hemisphere and broad, sustained vigilance in the right has been repeatedly described not only in mammals, but in amphibians, reptiles and birds,²² as well as in fish, which are more likely, for example, to bite targets viewed on the right, the left hemisphere focussing on prey, than on the left.²³ The same predilections have been demonstrated in cuttlefish, who attack prey in the right visual field (LH) and scan for predators using the left visual field (RH).²⁴ Indeed, lateralised behaviours have also been demonstrated in many invertebrates,²⁵ including molluscs,²⁶ bees,²⁷ ants,²⁸ and spiders.²⁹ The slug *Limax* memorises food odours asymmetrically in its procerebral brain divisions.³⁰ Asymmetries of behaviour can be traced back more than 500 million years, and have been identified from fossils of trilobites.³¹ The nematode *Caenorhabditis elegans*, which evolved about 600 million years ago, and which has a nervous system of just 302 neurones, expresses chemoreceptors with left-right differences.³² As Onur Güntürkün puts it, 'if animals from nematodes to humans show asymmetries of brain and behaviour, we should expect that left-right differences provide some important fitness benefits'.³³

And it is not *just* a matter of sharing out the tasks, though that comes into it, because, if it were, the work would be both randomly, and equally, distributed. But it is not. It matters which way round the tasks are distributed.

Sometimes this phenomenon can be surprisingly marked, as demonstrated by an experiment in lizards. Lizards that use only their right hemisphere (left eye) in exploring a new environment react faster and more efficiently than those with a reverse pattern;³⁴ and the same, more successful, individuals, that use the right hemisphere for exploration and watching out for predators, also use the left hemisphere (right eye) for tracking prey.³⁵ In the experiment, lizards had a patch placed over one eye; they were then presented with a (simulated) predator, placed on the side of the non-patched eye. Lizards with the left eye uncovered naturally carried on using the left eye (right hemisphere) to monitor the predator, but – get this – lizards with the right eye uncovered, and the left eye patched, nonetheless tried to use the covered left eye.³⁶ Put this together with evidence that birds choose to examine predators with their left eye³⁷ to such an extent that if they happen to detect a predator first with their right eye, they will actually turn their head so as to examine the scene further with the left³⁸ – and a picture emerges. Conversely, there is a strong right eye (left hemisphere) bias for tool manufacture in crows, even where using the right eye *appears to make the task more difficult*.³⁹

Is this difference in attention, then, also true in humans?

Indeed it is – and that evidence I have covered elsewhere.⁴⁰ Not just the breadth (right hemisphere) and narrowness (left hemisphere) of attention are strongly preserved in humans, but even the predator versus prey distinction.⁴¹ I will have much more to say about how these differences in attention change the nature of the world that is perceived. But some preliminary remarks may help to orientate us to what is coming.

The narrow-beam, precisely focussed, piecemeal attention of the left hemisphere, aimed at a particular object of interest, is, as we have seen, the kind paid by an animal locking onto its prey. In humans the left hemisphere is designed for grasping, controls the right hand with which we grasp (as well as those *aspects* of language which enable us to say we have ‘grasped’ something – pinned it down) and helps us manipulate, rather than understand, the world. It sees little, but what it does see seems clear. It is confident, tends to be black and white in its judgments, and jumps to conclusions. Since it is serving the predator in us, it has to if it is to succeed. It sees a linear relationship between the doer and the ‘done to’, between arrow and target.

By contrast, the wide-open, vigilant, sustained attention of the right hemisphere, without preconception as to what it may find, is designed to look out for all the rest – whatever else might be going on in the world while we are busy grasping. Its purpose is to help us *understand*, rather than manipulate the world: to see the whole and how we relate to it. It is more exploratory, less certain: it is more interested in making discriminations, in shades of meaning. Since it is serving the survival instinct and the social animal in us, it has to be if it is to succeed. All relationships in this hemisphere's world reverberate, changing both parties, and there is no simple linear cause and effect. Its attention, one might say, is not so much linear as in the round.

According to our left hemisphere, reality should be independent of our observation. It is seen as a collection of things 'out there' – things that are effectively inert, unless moved mechanically, since they have no inner life of their own, and they are not involved with ours. Our life merely enables us to observe them in a detached way (the more detached the better, because then our observations are not contaminated by any input from us). Reality should certainly not be to any degree a product of the imagination, since imagination means – surely? – that we are deceived.

But what if, as our right hemisphere can more readily detect, it were not an essentially lifeless assemblage of things, but a constantly self-creating process? What if imagination was essential to the process of understanding – including, importantly, scientific understanding?

THE NATURE OF HEMISPHERE DIFFERENCES

There is nothing about the hemispheres that is symmetrical. That is not only, as I believe, a psychological truth with important metaphysical consequences – the theme of this book – but a brute physical fact. Asymmetries in the human foetal brain are visible to the naked eye as early as the 11th week of gestation.⁴² The hemispheres differ in size, weight, shape,⁴³ sulcal-gyral pattern (the convolutions on the cortical surface),⁴⁴ neuronal number,⁴⁵ cytoarchitecture (the structure at the cellular level),⁴⁶ neuronal cell size,⁴⁷ dendritic tree features,⁴⁸ grey to white matter ratio,⁴⁹ response to neuroendocrine hormones and degree of reliance on different neurotransmitters.⁵⁰ Added to which, as any clinician could tell you, it is not just the site, but the side, of a brain lesion that matters: it makes a huge difference to what happens to the subject's world. So the idea that there is no significant difference is simply a non-starter. It's just a question of what the differences are – and why they are there.

Students of animal behaviour not only find that the birds and other animals they study behave 'asymmetrically' (ie, to use their two hemispheres to pay predictably different kinds of attention), but that individual animals whose brain hemispheres are not sufficiently differentiated, and who do not exhibit the normal structural and functional asymmetries that are present in other members of their species, are at a competitive disadvantage and survive less well. This is summed up in an adage familiar to students of animal behaviour: 'asymmetry pays'.

In humans, too, an absence of the usual asymmetries of brain structure and function is detrimental. This was something that I had cause to ponder when I was engaged for a while in neuroimaging research at Johns Hopkins University Hospital in Baltimore, back in the 1990s. We were looking at structural asymmetry in the brains of subjects with schizophrenia, and found that in many cases the normal asymmetrical pattern was either absent or reversed. The reversed or absent asymmetries involved areas (known as heteromodal association cortex) that are important in language, social functioning and the business of making sense of the world at the highest level – areas of life that just happen to be those in which subjects with schizophrenia encounter major problems. What is especially fascinating is

that the abnormally symmetrical areas were often the result not of a failure to enlarge on one side but of a failure to shrink— or, at any rate, a failure to remain unenlarged — on the other. Was there something important not just about absolute size, but about *relative* size, and how this affected the equilibrium of a relationship? What was at stake?

As it happened, I already knew that attention was an important issue in schizophrenia. For example, subjects with schizophrenia fail to grasp the whole for being focussed on the parts. And I also knew that this was a characteristic difference between right (seeing the whole) and left (seeing the parts) in the brain.

Being aware of how one's attention shapes the world is not easy. And that's because there is a kind of vicious circle at work: the more one pays, for example, dehumanising, mechanising attention to the world, the more only those aspects of the world that can be construed in terms of mechanisms stand forth. The rest recedes. And, as they say, to a man with a hammer everything begins to look like a nail. The way we start out looking at the world soon hardens up; and after a while, any model comes to look like a surprisingly good fit, largely because everything that doesn't fit that model becomes helpfully invisible.

To say that attention grounds everything in the world of experience might still sound like just a manner of speaking, almost a rhetorical flourish. But in the chapters that follow we will see just how *literally* attention brings the experienced world into being. Everything we know is partly ours and partly not ours. Does the earth orbit the sun, or does the sun orbit the earth? Surely that's knowledge in which we play no part? Not actually: it depends on your point of view. When two masses are related in this way, seeing either one of them as still makes the other one appear to circle it. And one does not need to go to the quantum level in order to see how dependent reality is on our participation in it. Things that are very real, in the everyday sense that they can be recorded and measured, and experienced by anyone who is in the right place at the right moment, may nonetheless depend ultimately on consciousness to be what they are. I cannot summon up a rainbow at will, and yet its very real existence at a certain moment of time and space, dependent on factors clearly far beyond my control, such as rain and sunlight, is also dependent on my consciousness to view it, just as the sound of a tree crashing in a forest exists only in the presence of a hearing ear.

Let me sum up so far. There is nothing controversial in the view, undisputed by neuropsychologists and neurologists, that the hemispheres pay different types of attention to the world, in humans as in animals. It is similarly undisputed by neuropsychologists and philosophers that the type, and extent, of attention we pay changes the nature of the world that we experience. And since each hemisphere on its own is perfectly capable of yielding a coherent experiential world, the conclusion is therefore logically inescapable: that this situation should give rise to two different experiential worlds, with different qualities. It couldn't be otherwise. So there should be evidence that this is indeed the case. Is there?

Evidence from a wealth of sources, including brain insults (trauma, stroke, tumour, etc), neuropsychological experiments in normal and post-commissurotomy ('split-brain') subjects, and brain imaging in a range of modalities, suggests, precisely, that this is the case.⁵¹ This is a fact about human life, the implications of which are only now being uncovered. The evidence was available, however, from the turn of the nineteenth/twentieth century, and ignored or dismissed, a story I will come to later.

Before we move on, let me clear one misconception out of the way at this stage. I am aware that a hemisphere on its own cannot properly be said to do what only a person can do: 'believe', 'intend', 'decide', 'like' and so on. These and similar formulations should be understood as avoiding the repetition of such cumbersome locutions as 'a person relying on the faculties of the left (or right) hemisphere believes (intends, decides, likes)', etc. You are *not* your brain, you are a living human being, as philosopher of neuroscience Alva Noë emphasises: 'the idea that a person is a functioning assembly of brain cells and associated molecules is not something neuroscience has discovered. It is, rather, something it takes for granted.'⁵² And shouldn't.

Some of the headline differences, very much in shorthand form and for present purposes only, are listed below. For those who want to read more about each topic, I have included references in the notes to relevant pages in *The Master and his Emissary*, though these are not intended to be exhaustive.

1. The LH is principally concerned with manipulation of the world; the RH with understanding the world as a whole and how to relate to it.⁵³

2. The LH deals preferentially with detail, the local, what is central and in the foreground, and easily grasped; the RH with the whole picture, including the periphery or background, and all that is not immediately graspable. The importance of the global (RH)/local (LH) distinction cannot be overstated. It is also extremely robust.⁵⁴ ‘Perhaps the most compelling distinction between local and global visual processing is the differential lateralisation in the brain’;⁵⁵ ‘evidence to support this hypothesis comes from a wealth of data’.⁵⁶
3. The RH is on the lookout for, better at detecting and dealing with, whatever is new, the LH with what is familiar. VS Ramachandran calls the RH the ‘devil’s advocate’, since it acts as an ‘anomaly detector’, on the lookout for what might be erroneously assumed by the LH to be familiar.⁵⁷
4. The LH aims to narrow things down to a certainty, while the RH opens them up into possibility. The RH is able to sustain ambiguity and the holding together of information that appears to have contrary implications, without having to make an ‘either/or’ decision, and to collapse it, as the LH tends to do, in favour of one of them.
5. In line with this, the style of the RH is altogether more circumspect than that of the LH, which tends to be less self-critical.⁵⁸
6. The LH tends to see things as isolated, discrete, fragmentary, where the RH tends to see the whole. The LH tends to see things as put together mechanically from pieces, and sees the parts, rather than the complex union that the RH sees.⁵⁹
7. The LH’s world tends towards fixity and stasis, that of the RH towards change and flow.⁶⁰
8. The LH tends to see things as explicit and decontextualised, whereas the RH tends to see them as implicit and embedded in a context. As a result, the LH largely fails to understand metaphor, myth, irony, tone of voice, jokes, humour more generally, and poetry, and tends to take things literally.⁶¹
9. There is a tendency for the LH to prefer the inanimate, the RH the animate. Machines and tools are alone coded in the LH, too, while

the animate is coded by both hemispheres, though preferentially by the RH.⁶²

10. The RH understands narrative. The LH, if offered a story whose episodes are taken out of order, tends to regroup them so as to classify similar episodes together, rather than reconstruct them in the order that has human meaning.⁶³
11. Both hemispheres need to categorise, but do so according to different strategies. The LH tends to categorise using the presence or absence of a particular feature; the RH tends to do so by reference to unique exemplars, using what Wittgenstein called a 'family resemblance' approach – it sees the *Gestalt*.⁶⁴
12. More general categories are dealt with preferentially by the LH, more fine-grained ones, as one approaches more closely uniqueness, by the RH. Damage to the RH can lead to a loss of the sense of uniqueness or the capacity to recognise individuals altogether.⁶⁵
13. The RH contains the 'body image' (this is a slightly misleading neuropsychological term which refers not just to a visual image, but to a multimodal schema of the body as a whole). The LH tends to focus on parts – arms, legs and so on – out of which the body must then be constructed. The RH tends to process in a more embodied, less abstract fashion than the LH. The RH is also superior at reading body language and emotion expressed in the face or voice.⁶⁶
14. The LH is superior for fine analytic sequencing and has a larger linguistic vocabulary and more complex syntax than the RH. Pragmatics, the ability to understand the overall import of an utterance in context, is, however, a RH function. Understanding prosody, the musical aspect of language, its tone, inflection, etc, depends to a very large extent on the RH.⁶⁷
15. For most of us, music is very largely the province of the RH, the LH dealing only with simple rhythms.⁶⁸
16. The RH is essential for 'theory of mind': that is to say that it is better able to understand another's point of view.⁶⁹
17. The RH is essential for empathy.⁷⁰

18. In very general terms, both emotional receptivity and expressivity are greater in the RH.⁷¹
19. The RH is better at seeing things as they are pre-conceptually – fresh, unique, embodied, and as they ‘presence’ to us, or first come into being for us. The LH, then, sees things as they are ‘re-presented’, literally ‘present again’ after the fact, as already familiar abstractions or signs. One could say that the LH is the hemisphere of theory, the RH that of experience; the LH that of the map, the RH that of the terrain.⁷²
20. The LH is unreasonably optimistic, and it lacks insight into its limitations. The RH is more realistic, but tends towards the pessimistic.⁷³

These could be understood (LH-fashion) as 20 separate distinctions. Indeed that is how they have been seen, and still are seen, by most brain researchers. But they are (as the RH would see them) just an arbitrary number of attempts to give different sidelights on two distinct, entirely coherent versions of the world.

And it is the deep coherence of each world that is to me striking. People sometimes say to me, ‘the worlds of the two hemispheres that you describe stand on their own as having human meaning: do they need an evolutionary underpinning in the brain?’ Whether the picture *needs* such an underpinning or not, it *has* such an underpinning – and that underpinning has both theoretical intellectual import and lived human significance. Bipedalism (walking on two legs) helps to explain a number of findings that might not seem immediately connected, such as higher rates of death in childbirth compared with other species, differential retention of body hair on the top of the head, and the development of opposable thumbs that can make and wield tools. Knowing about the bi-hemispheric structure of the brain similarly helps to explain why certain facets of human thought and behaviour tend reliably to go together; it helps us to know ourselves, to recognise our strengths and limitations.

People have at various times intuited the relationship between one or two, or even several, of the 20 elements listed above that distinguish the hemispheres. Indeed, if I am right it would be odd if they had not. But they might not necessarily have seen why a detail-focussed vision, a tendency to see things as inanimate, problems with metaphorical understanding, and

unreasonable optimism, tend to go together; and, moreover, why we have difficulty seeing beyond a vision of the world that looks logical, but at a deep level isn't really logical at all. Whatever else, the hemisphere hypothesis helps us become aware of *who we are*, what it means to be a human being at all. It makes both immediate intuitive sense of disparate phenomena from the 'inside', and consolidates a view of ourselves that is verifiable from the 'outside' by massively detailed scientific data. This seems to me what the business of science at its best should involve.

So how might one characterise, as a whole, each hemisphere's vision of reality? One view, the left hemisphere view, is of a world composed of static, isolated, fragmentary elements that can be manipulated easily, are decontextualised, abstracted, detached, disembodied, mechanical, relatively uncomplicated by issues of beauty and morality (except in a consequentialist sense) and relatively untroubled by the complexity of empathy, emotion and human significance. They are put together, like brick on brick to build a wall, so as to reach conclusions that are taken to be unimpeachable. It is an inanimate universe – and a bureaucrat's dream. There is an excess of confidence and a lack of insight. This world is useful for purposes of manipulation, but is not a helpful guide to understanding the nature of what it encounters. Its use is local and for the short term.

In the other (the right hemisphere version), as in the world the map represents, and in the world revealed to us by physics, by poetry, and simply by the business of living, things are almost infinitely more complex. Nothing is clearly the *same* as anything else. All is flowing and changing, provisional, and complexly interconnected with everything else. Nothing is ever static, detached from our awareness of it, or disembodied; and everything needs to be understood in context, where, if it is not to be denatured, it must remain implicit. Here, wholes are different from the sum of the parts, and beauty and morality, along with empathy and emotional depth, help us to intuit meaning that lies beyond the banality of the familiar and everyday. It is an animate universe – and a bureaucrat's nightmare. This is a world from which we cannot detach ourselves, since we are part of it and affect it by our relationship with it. The overall timbre is sober and tentative. This world is truer to what is, but is harder to comprehend and to express in language, and less useful for practical issues that are local and short-term. On the other hand, for a broader or longer-term understanding the right hemisphere is essential.

Long before we had anything other than the most rudimentary knowledge of hemisphere difference, a number of philosophers – Pascal, Spinoza, Kant, Goethe, Schopenhauer, Nietzsche, Bergson and Scheler among them – were able to intuit that there are two fundamentally distinct ways in which we approach the world, what Bergson called ‘two different orders of reality’. I would tentatively suggest that many of the great questions of philosophy in fact turn on which one you choose, an idea I explore throughout the rest of this book. One way of looking at paradox is as an indicator that we are dealing with two apparently valid world-pictures which yet do not concur.

These two ways of seeing the world are each vital to our survival. We need to simplify and stand apart to manipulate things, to deal with the necessities of life, and to build the foundations of a civilisation. But to live in it, we also need to belong to the world and to understand the complexity of what it is we are dealing with. This division of attention works to our advantage when we use *both*. However, it is a handicap – in fact, it is a catastrophe – when we use only one.

SOME POTENTIAL CAUSES OF CONFUSION

So much for what I am saying. Equally important is what I am not saying.

a. Surely we all use our brains as a whole, not just one hemisphere?

Naturally, this is almost invariably the case. My point is a different one: that each hemisphere has inevitably a distinctive ‘take’ on the structure of the world, which is why we have two hemispheres at all. And each ‘take’ appears, when pondered in the abstract, strictly speaking incompatible with the other. They are each internally consistent, but mutually impossible. In the business of getting on with life, this is not a problem: we accept that the world is complex and multifaceted, and that truths are partial, and we wisely draw on what either hemisphere offers, as the situation demands, without even being aware of it. In neurological terms, the two versions of the world are evenly and rapidly drawn on, probably mediated by a meta-control centre in the midbrain (the head of the brainstem, and one of the most ancient parts of the brain), a process which is *necessarily* below the level of conscious awareness: if it weren’t, we would be incapable of acting.⁷⁴

However, we live in a society where talking about life is as much our defining quality as living it. And when it comes to articulating a philosophy, or a working model by which to understand our society and the wider world, that wisdom suddenly disappears in the mind of the public spokesman, politician or scientist in the need not to appear foolish. We become unnaturally self-scrutinising, and self-consistency suddenly becomes of prime importance. Regrettably we would rather speak falsely, if doing so means we do not seem to contradict ourselves: we realise that it is much simpler for our point of view to be dismissed as self-contradictory than untrue. Given this cast of mind, it is easy to see how one might easily argue one’s way into believing something which one knows perfectly well at a deeper level to be untrue. We are virtually forced to it by our desire to appear consistent to some – rather too simple – position.

Under these circumstances, two things follow. First, we are under almost irresistible pressure to adopt a view consistent with one

hemisphere's take or the other: it is too risky to draw, as we should, on both. And second, one of these takes, namely that of the left hemisphere, is very much simpler – indeed it is simplistic; and therefore far easier to articulate. It sees matters as black and white, 'either/or'. The right hemisphere sees the nuances, as well as that we often must embrace two superficially incompatible truths in a 'both/and' – one, moreover, that includes embracing both its own take *and* that of the left hemisphere: altogether a far harder, and more complex, view to articulate. (It is the purpose of education to enable us to do just this.) So it is clear which will get adopted by those who want to appear smart. The preference for consistency over truth is itself characteristic of the left hemisphere, as we will see; and it is inevitable that it results in an espousal of its own take.

b. 'Are you suggesting that the brain causes human experience?'

I do not suggest that the brain originates anything. I do not know that the brain 'causes' consciousness: it might or might not. For example, it might transduce, or otherwise mediate, consciousness. I have my own view on that, which I will come to in a later chapter. But it is a matter of likelihoods: I know of no way of proving the point one way or the other, since the observable facts would look the same whether it gave rise to, or simply mediated, consciousness: just as an alien could not tell merely by looking in the back of the TV set whether it gave rise to, or transmitted, the material it shows. In any case, nothing in the hemisphere hypothesis depends on the question being decided one way or the other.

Nor do I suggest that the brain determines events in the lived world – whether at the level of an individual or of a society in general. I *do* think one way of looking at human experience is to look at how it is shaped by the choices our brain permits us. But there are many other ways. For example, if you ask me why I robbed an old lady, I could reply: 'I needed the money', 'I had just watched a violent video', 'I inherited my dad's psychopathic tendencies', 'I was high on crystal meth', 'I heard a voice tell me to do it', 'I was brought up in a subculture where it was considered normal to steal', 'the government cut my welfare payments', 'my serotonin levels were depleted', and so on. What counts as a possible cause depends on the context of the question. I do not invoke the brain in order to trump other types or orders of explanation, be they psychological, sociological,

environmental, genetic, economic, technological or political, especially since they are inextricably intertwined one with another. Indeed, I do not attempt to ‘explain’ experience at all in the causative sense. Nor do I invoke the brain in order to tell us what experience ‘really is’, which it never could, but to illuminate the constraints on our understanding, which it can.

What I mean by that is best explained by analogy. While accepting that, by definition, no analogy can be exact when it comes to the brain and mind, because there is nothing at all like them to compare with, let me at least make the attempt.

Imagine you are studying the migratory patterns of a certain species of bird. Although we see them soaring and wheeling like free spirits – ‘free as a bird’, we say – they are subtly tethered to the earth. They have freedom to go where they want, it is true, but within certain constraints that are dictated by the realities of their embodied being. To understand a bird’s migratory patterns would require knowing something about the landscapes over which it flies – the opportunities for food and shelter they afford, the weather patterns they give rise to, and so on. These facts would not ‘cause’ the migration, still less are they themselves the migration, nor could they ‘explain it away’: they would simply indicate the constraints on the migration, that helped account for the pattern it *tended* to take. Sometimes, for contingent, or no discernible, reasons, a bird or birds might vary the pattern considerably and end up in Iceland instead of Scotland. But generally there would be a familiar shape to it, understandable in terms of the whole context: the nature of the land, sea, weather, fauna and flora through and over which the migration route passes.

Imperfect, inevitably, as the analogy is, I think it can hint at something about the relationship between our experience and the brain. Understanding the structure of the brain and how it functions can help us see the *constraints* on consciousness, much as, to use another metaphor, the banks of a river constrain its flow and are integral to its being a river at all, without themselves being sufficient to cause the river, or being themselves the river, or explaining it away. All experience in this life as we know it (and this applies whether we conceive the brain as the originator, or as a transducer, of consciousness) comes to us through the brain, and is therefore inevitably constrained, and shaped, by it. This is most obvious to us through there being many elements of our environment – certain pitches of sound, certain wavelengths of light, for example – that, though detectable by the

brains of other animals, are not detectable by ours. It also becomes obvious when, through some stroke, injury or other brain insult, aspects of normal experience disappear from the subject's world.

c. 'Are you suggesting that cultural changes reflect changes in brain structure?'

No. Of course the brain is evolving all the time, so strictly speaking there will be fine structural changes over a few thousand years, but it is not these I mean. The time period invoked is far too short for anything like that. It is not the changes in the brain itself that matter, but the way in which we use it. An analogy might be with a radio set: to begin with you try different channels, but after a while you begin to tune into only one. The other channels are still there – it's just that you are no longer listening to them.

d. 'Surely the hemispheres are always operative together?'

I frequently emphasise that both hemispheres are involved in absolutely everything we do. It cannot, however, be an argument against hemisphere differences. Both the scrub nurse and the surgeon are important members of the surgical team, and work together, at the same time, on the same task: an operation becomes hazardous in the absence of one, and impossible in the absence of the other. They work well together not because they have the same role, but precisely because they have different ones.

e. 'How can you talk of a hemisphere as a whole? It's all about local regions'

I do not deny the obvious fact that regions are important (one can subdivide them into ever smaller 'regions of interest' until one is looking at tiny clusters of neurones, and ultimately at the activity of a single neurone). Both in this book and in *The Master and his Emissary* there is detail about localisation, often in the notes, for those who wish to know more. But at the same time, there are emergent phenomena from the whole interconnected system at the hemisphere level, and neuroscience increasingly recognises that we should think in terms of complex widespread networks.⁷⁵ There are

two such networks, *par excellence*, maximally connected within themselves, that are each capable of supporting consciousness on their own: the two brain hemispheres. At the phenomenological level, they are the most important and complex collocations of neuronal matter underlying consciousness. The hemispheres are massively more intraconnected within themselves than they are connected to one another.⁷⁶

So, as in life, science needs both narrow focus and broad vision. Great work is done at the local level. This book is about what goes on at a higher level than that of intrahemispheric regions alone – though a very significant intrahemispheric distinction that will emerge regards the inhibitory effect of the frontal region of each hemisphere on its own posterior cortex. Nonetheless, this should not be thought of in purely antagonistic terms, but in dialectical terms, whereby something new is brought about through their joint action.

f. ‘The differences are not absolute’

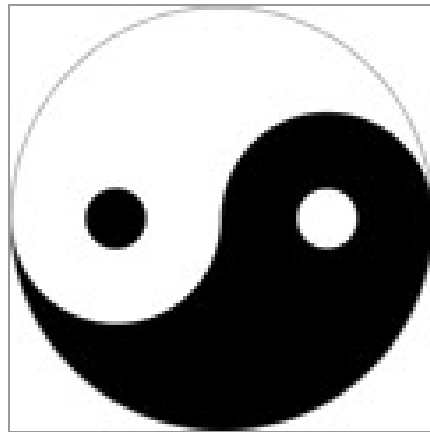
This is, of course, true, and I often find it necessary to point out that hemisphere differences are never absolute. In biology scarcely anything is absolute. For example, left- or right- handedness, an issue I do not deal with in this book, and which is only indirectly related to hemisphere differences, is a commonly observed, highly significant phenomenon. But it is rarely absolute.⁷⁷ In a complex system like the brain it is never that there are black and white, all or none, differences – indeed, requiring them is itself a typical left hemisphere demand.

Many significant facts are found out only by tendencies in large data sets. Except in an imaginary world, almost all truths are of this kind. It is also to some extent a matter of judgment what is considered a significant difference.

Without generalisations we come to a standstill, but it is in the nature of generalisations to be imprecise and allow of exceptions. The average annual temperature in Indonesia is indisputably higher than that in Iceland, a fact that has many consequences for the vegetation, animal life, landscape, culture and economy of these two regions, as well as much else that differentiates their ‘feel’ and the ways of life in each country. If someone who knew them both well called them two different ‘worlds’, we’d know

what was meant. But it is also true that the highest average annual temperature ever recorded in Iceland is *higher* than the lowest average annual temperature ever recorded in Indonesia. There is overlap.

This comment on dualities is beautifully illustrated by the *taijitu*. There is a little bit of yin in the yang and a little bit of yang in the yin, and the duality of yin and yang, while remaining distinct, together compose a single perfect circle.



Furthermore, in the case of the brain, what may start out as small differences are inevitably magnified, since there is a ‘winner takes all’ principle at play. If one hemisphere is marginally better adapted than the other at a certain way of dealing with the world, it quickly becomes the preferred hemisphere to be involved in such tasks under virtually all circumstances, not just marginally more often than its counterpart. And with use it becomes better adapted still. Thus the hemispheres compound through experience the differences that genetics and embryology have laid upon them.

g. ‘But aren’t you dichotomising?’

I have not invented that hateful thing, a dichotomy. Some people are just against what they call ‘dichotomising’, feeling it is ‘simplistic’. But such a view is itself simplistic. There are, after all, different types of dichotomies. Some are inevitable, such as between plants and animals – even though there exist microscopic life forms that defy such categorisation. Some are entirely spurious. Elsewhere I have quoted

whoever it was who said that ‘there are two types of people in this world: those who divide the world into two types of people, and those who don’t’. Dichotomising has its problems.

An example of a very poor dichotomy would be ‘good drivers’ and ‘bad drivers’. There is no fundamental difference between the two. We have invented a dichotomy out of a continuum. It doesn’t make the distinction entirely meaningless, but it is not a good example of a valid dichotomy.

Then there are other continua where a dichotomy is more legitimate, though open to rather too many qualifications. For example, we can speak of left-wing and right-wing philosophies of society. This distinction does point to two underlying phenomena that are different in character, not just more or less of something. There is a continuum here, too, but it is between two, in themselves coherent, entities that, at least in their characteristic forms, are readily enough distinguished. There is more content, and more purpose, to the distinction here – misleading as I agree it can be at times.

Then there is a dichotomy based on the existence of two separate phenomena: say, Hinduism and Christianity. I am not saying that there might not be people who claim allegiance to both at once; nor that there may not be commonalities between the world views involved; nor, obviously, am I suggesting any form of antagonism between their proponents. I am just drawing attention, for the purposes of argument, to the fact that these are two coherent entities, which undoubtedly have points of overlap, but are generally distinct phenomena – culturally, historically and philosophically. This is an example of a dichotomy which it would be irrational to disregard, or pretend didn’t exist. It obviously does.

In other words, there are some dichotomies that have no basis, some that have a partial basis in fact, and some that it would be mistaken to pretend don’t exist. The division of the cerebral hemispheres falls into this last category, a ‘dichotomy’ made not by me, but by nature, which it would be profoundly irrational to ignore just because we don’t like dichotomies. Evolution has taken care to preserve, and even to intensify, the division of the brain, this organ whose whole purpose is to connect. The hemispheres differ in their structure and function at every level. So let’s not say we are dichotomising when we take a look at why that should be. What every intelligent person should want to know is: why is this the case? I am not saying I have all the answers, just some suggestions, appropriately backed by scientific evidence, and open to modification in the course of time.

All intellectual distinctions can be abused or misappropriated. Hemisphere difference is no exception. But the last thing we should do is ignore such distinctions, because ‘dichotomies’ don’t happen to fit the view of the world we already happen to have.

h. ‘The hemispheres are more alike than they are unlike’

This phrase has occasionally been used as if to counter the argument for hemisphere difference. But some level of likeness is not a proof that there are no substantive differences: indeed, there is little point in comparing any two things unless they have some broad similarities. It is as though I were to say, ‘there are fascinating and important differences between a cat and a mouse’, and you were to object that ‘they have more in common than they have different’. Whatever exactly this expression means (and it is not entirely clear), it is irrelevant, because sometimes it’s the differences that matter – as between Donald Trump and Albert Einstein, or an old banger and a new Ferrari. And so it is with the hemispheres: they have much in common, but, when contrasting them, it’s the differences that count.

i. ‘Actually, the hemispheres work in the same way’

Importantly we can describe, explain and understand complex systems at different levels. Those who stick resolutely to one level will fail to comprehend points made at another level. This fallacy is easy to spot for those with clinical experience of the brain as part of a person, because they see it every day; but it appears harder to spot for those who are more comfortable with machinery than human beings. As a result, some neuroscientists have difficulty shifting focus from the machine level, a level irrelevant to the differences that are being posited. (Actually the hemispheres do not work in entirely the same way even at a *technical* level – but that is beside the immediate point.)

Such objectors might, to use the same example, contradict the suggestion that the cat and the mouse see the world differently, along the lines that in order to see the world they both (as indeed do humans) use almost identical visual systems (involving the retina, optic tracts and radiations, tectum, visual cortex, etc), which comprise distinct dorsal and

ventral streams – and so on. Similar arguments can be made about every aspect of the organism as long as you examine them purely at the level of *mechanism*. This objection has its point, but the point is irrelevant, since cat and mouse ‘see’ the world (and perceive the world in other modalities) differently, and make sense of it in different ways, which are reflected in different types of behavioural responses that can be experimentally measured.

Moreover, these differences are not just single independent facts that have to be strung together, or extended from one area – say, vision – to another – say, hearing – because they are all part of one large underlying difference, which makes sense of the *whole*: what it means and what it takes to lead two very different types of life, that of the predatory cat and that of the watchful mouse. The basic mechanisms, at the technical level, that help them see are irrelevant, not just because they are largely held in common by cat and by mouse, but because they lie in the wrong plane of focus. It would be like trying to examine the difference between Fox News and Al Jazeera by focussing on the mechanics of studio lighting, cabling, cameras, TV signal transmission, cathode ray tubes, plasma/LED screens, etc – and solemnly concluding there was none.

This is particularly likely to happen the more we rely on imaging data, in which we are essentially looking at the detail of the ‘wiring’. By contrast, lesion studies, split-brain studies and tachistoscopic or dichotic-listening tasks (laboratory techniques that make it possible to separate input to each hemisphere), in which we are working at a more phenomenological level, are likely to be more revealing.

It may be responded that ‘the hemispheres are complex machines, not separate conscious beings’. But that is also misguided. A machine and a person are both just models that illuminate and obscure different aspects of the brain. The brain isn’t actually either simply a machine or simply a person. Each hemisphere can obviously sustain consciousness on its own – and appears to sustain not just different ‘cognitive strategies’, but different goals, values, opinions and emotional timbres, all of which are in reality inseparably interconnected with one another and with cognition. The ‘person’ model looks like a better fit than the ‘machine’ model, especially since a hemisphere is at least a manifestly important part of a person, and isn’t like any machine we have even got near inventing.

In 2003, four researchers who spent many years examining split-brain patients commented in a jointly authored paper in the classic textbook of neuropsychology, *Clinical Neuropsychology*, that, with experience,

examiners spontaneously refer to the two hemispheres as if they were distinct people, e.g., ‘the LH was upset at the RH responses today’. While such references may be regarded as shorthand for patterns of behaviour with specific lateralized stimuli and responses, they nonetheless express a strong phenomenological sense of two coexisting streams of consciousness. Both hemispheres can probably be simultaneously and independently conscious; both can simultaneously possess conflicting wills so that the split-brain can exhibit two distinct, and possibly incompatible, loci of moral responsibility.⁷⁸

Equally, research on split-brain patients taught Roger Sperry, who won a Nobel prize for this work,

that the two disconnected hemispheres function independently and in effect have each a separate mind of its own. Each of the separated hemispheres appears to have its own private sensations, perceptions, thoughts, feelings, and memories. Each hemisphere has its own inner visual world, each cut off from the conscious awareness of the other.⁷⁹

He also thought the evidence ‘favours the view that the minor [right] hemisphere is very conscious indeed, and further that both the separated left and the right hemispheres may be conscious simultaneously in different and even conflicting mental experiences that run along in parallel’.⁸⁰ In those days, notice, it was even necessary to argue that the right hemisphere was conscious at all. And Bogen, one of Sperry’s most distinguished colleagues, refers to two ‘crucial facts’: that ‘*it takes only one hemisphere to have a mind*’, and that ‘*hemispheres can sustain the activity of two separate spheres of consciousness following commissurotomy*’.⁸¹ Here is Sperry again:

Each hemisphere [in commissurotomy patients] can be shown to experience its own private sensations, percepts, thoughts, and memories that are inaccessible to awareness in the other hemisphere. Introspective verbal accounts from the vocal left hemisphere report a striking lack of awareness in this hemisphere for mental functions that have just been performed immediately before in the right hemisphere. In this respect each surgically disconnected hemisphere appears to have a mind of its own, but each cut off from, and oblivious to, conscious events in the partner hemisphere.⁸²

Thirty years after he first wrote about hemisphere differences in the *Scientific American*, Michael Gazzaniga, another giant in the field, who also worked on split-brain patients, was invited to revisit the topic in the light of three decades of research. His summary?

Despite myriad exceptions, the bulk of split-brain research has revealed an enormous degree of lateralisation – that is, specialisation in each of the hemispheres.⁸³

More recently, Onur Güntürkün, one of the leading researchers in the field of brain lateralisation today and a winner of Germany's most prestigious science award, the Gottfried-Wilhelm-Leibniz-Preis, for his work on lateralisation, has publicly supported the idea that the hemispheres underwrite differing aspects of personality, as well as, of course, attention and cognition: 'I believe that, at a deep level, McGilchrist is right. In the hemispheres, with their differing components and capabilities, lie different facets of the personality.'⁸⁴ And Claude Braun and Sabrina Suffren, a leading research team in lateralisation, see, as do I, a differing *disposition* that enables the hemispheres to work together and apart: 'the two hemispheres compete and co-operate with one another to maintain an online balance of two fundamentally opposed dispositions.'⁸⁵

The tendency in recent years has been to downplay the distinctions so clearly made here – possibly part of the general denial that has surrounded until recently the topic of hemisphere differences. When they have been referred to, the point made has almost invariably been, not that Sperry was

wrong to see what he saw – Sperry arguably spent more time observing commissurotomy patients than anyone who ever lived, and his conclusions were in accord with those of other observers, so that would be unlikely – but that it is a mistake to extrapolate from the observed differences in the hemispheres of a split-brain subject to the hemispheres of a normal subject, where such differences are not commonly manifest.

But this, too, is, I suggest, mistaken. That something is not manifest is not to say it doesn't exist. A marriage where one partner is domineering is exactly the situation where the couple may appear to be 'of one mind'. But to find out whether there truly is unanimity would require separating the partners sufficiently for their differences to be expressed. Before someone objects that the hemispheres are not a married couple, may I deflect such literal-minded thinking: the point is that real differences may be apparent only when circumstances permit. As I have pointed out, on introspection we are unable to detect that we have two kinds of experiential world, for the very good reason that the process of fusion goes on below the threshold of consciousness. The fact is manifest, however, as soon as one hemisphere, for whatever reason, stops functioning, as well as following callosotomy (the 'split-brain' procedure), but can even be demonstrated in normal subjects by experimentally suppressing one hemisphere at a time. In each case, these quite different experiential worlds are clearly, immediately, demonstrable. Where do those who deny hemisphere difference think they – in an instant – come from? Do they imagine they were suddenly created *ex nihilo*?⁸⁶ Furthermore, as I shall show in Chapter 1, the two hemispheres of the intact human brain have a large evolutionary investment in remaining distinct and to an extent autonomous.

For those who have read *The Master and his Emissary*, what will strike them about this list of misunderstandings is that it illustrates, in every case, a fallacy to which those who are over-reliant on left hemisphere thinking are vulnerable.

SHOULD ONE GO 'BEYOND THE FACTS'?

And there is another. Some people get uncomfortable if, as they tend to put it, one goes 'beyond the neurological facts'. This is, to be sure, an important point to raise: for where do the data cease and where does an understanding begin? What, we might ask, count as the 'facts' of the difference between the cat and the mouse? Is it just what you see from a neurological diagram, or is there more to it than that?

There is no hard and fast distinction here; it is matter of judgment to what degree we bring an understanding to bear on data. It is possible, then, to go too far, but also not to go by any means far enough. The human brain is where the physical world of measurable 'things' most intimately meets the rich complexity of human experience; when science is dealing with how consciousness brings the experienced world into being, it is not possible to avoid philosophy, including the history of ideas. Indeed the neglect of philosophy by science has been a disaster for science – and therefore for us all.

What counts, then, as going too far depends on a number of things, including the extent of the various hemisphere differences, whether there is any pattern or overall meaning to those differences, and the context in which you view them. If you don't know the extent of the differences (and very few people do), and if at the same time you can't see the overall picture (viewing the differences as just so much lab data, not something with significance for what it means to be a living person), then, yes, the argument has been taken too far. If you do and can, however – not far enough. Hence this book.

There's a world of difference between 'going beyond' the evidence, in the sense that your facts are wrong, and seeing the philosophical implications of those facts – how they hang together to create something greater, which inevitably 'goes beyond' them. That's what intelligent science is supposed to do – to progress beyond the mere accumulation of facts to an understanding of the question: 'who, then, are we?' Amassing facts on their own is not enough. Having said that, looking at an enormous amount of evidence is vitally necessary. The reader must judge for himself or herself whether the evidence is there.

I am not aware of a model that fits the data better. I don't say it is the last word; rather let it be the first of what I hope will be a new and fruitful discussion. The evidence is that that is already the case, and that's how science progresses. One model cedes to another. Or as the philosopher Alfred North Whitehead put it, 'in this way mankind stumbles on in its task of understanding the world.'⁸⁷ Understanding always means interpretation. Whitehead again:

The production of a scheme is a major effort of the speculative reason. It involves imagination far outrunning the direct observations ... Millions had seen apples fall from trees, but Newton had in his mind the mathematical scheme of dynamic relations: millions had seen lamps swinging in temples and churches, but Galileo had in his mind his vaguer anticipation of this same mathematical scheme: millions had seen animals preying on each other, vegetables choking each other, millions had endured famine and thirst, but Charles Darwin had in his mind the Malthusian scheme. The secret of progress is the speculative interest in abstract schemes of morphology.⁸⁸

'Abstract schemes of morphology': all advances in science are made by observing patterns, by using metaphors and formal analogies. And, if we wanted examples, we have them at the highest level: Darwin in biology, Freud in psychology and Bohr in physics spring to mind. Not observing patterns would be like trying to understand the famous picture of the Dalmatian dog by refusing to go 'beyond' the given dots and splashes.⁸⁹ Seeing the dog requires a functioning right hemisphere. The left hemisphere thinks locally, one dot at a time, and gets – nowhere.

I do not suggest that cultural shifts, epochs in the history of ideas, are caused by changes in our brains, but that they are shaped by the way our brains structure reality – or reflect reality's structure. We are constantly balancing, synthesising and alternating two entirely self-coherent, but on the face of it mutually incompatible, views of the world: we do it entirely unconsciously, and at the individual level most of us do it skilfully, in such a way as to respond appropriately to the richly diverse nature of experience. Understanding the hemispheric structure of the brain helps us see that,

when the world view of a culture changes, it does not do so as an assortment of bafflingly independent changing elements, but according to a broadly coherent pattern that makes sense overall. Public discourse in a culture can accentuate some ideas, concepts, beliefs and values at the expense of others. And when this happens, it is not as if these ideas, concepts, beliefs or values are atomistic; they bring with them a largely coherent world-picture, which gradually forms itself in the culture, and over time is expressed in a myriad of ways. I believe our own culture is unbalanced in the degree to which the left hemisphere's take predominates. And, unfortunately, the left hemisphere is decidedly imperceptive – and so is unaware there is a problem.

Science is far too great an enterprise to be fettered by the silo mentality of the left hemisphere. In the end, it seems to me that neurology, philosophy and physics must all be approaching the same core of reality, though from their very different starting points, and I would expect the picture ultimately to cohere.

THE ASYMMETRICAL RELATIONSHIP BETWEEN THE HEMISPHERES

Because of the asymmetry of attention, each hemisphere has a different take on everything – *including on its relationship with the other hemisphere*. This is best illustrated by the story from which *The Master and his Emissary* takes its title. There was a wise spiritual Master who looked after a small community so well that it flourished and grew. Eventually the Master realised that he could not take care of all his people's needs on his own; more importantly, he realised that there were certain matters that he not only could not, but *must* not, become involved in, if he were to preserve his overview. He therefore appointed his brightest assistant to go about and do work on his behalf. Though bright, this emissary was not bright enough to know what it was he didn't know. He became arrogant and resentful of the Master: 'What does he know?', he thought. 'I'm the one that does the real work round here, I'm the one that really knows.' And so he adopted the Master's cloak, and pretended to be the Master. The emissary not knowing what it was he didn't know, the community declined, and the story ends with the ruin of the community, including both the Master and the emissary.

Not ignorance, but ignorance of ignorance, is the death of knowledge. The right hemisphere, however, knows what it is that it must not get involved with. In the story that is why the Master (the right hemisphere) appoints the emissary in the first place.

You may imagine that, when I say things like 'the left hemisphere does not seem to know what it is it does not know', I am speaking purely figuratively. But I am not. There are plenty of examples – particularly vivid in the case of split-brain patients, but often seen in more common situations such as stroke – in which the left hemisphere not only clearly does not know what it is talking about, but behaves as though it knows perfectly well. Its manner is confident and unhesitating, even when it is talking about something of which it knows absolutely nothing (I will discuss some striking examples in Part I). By contrast, the right hemisphere tends to be hesitant, tentative and flexible, even when it is entirely right.

There are a number of reasons for this. The left hemisphere is aware of much less of what surrounds it – 'sees less', in all senses, than the right. It is

less tolerant of ambiguity and tends towards exclusive, ‘either/or’, thinking; the right hemisphere is more inclusive, inclined to ‘both/and’ thinking. This is imaged in the relationship of the two hemispheres: the right hemisphere communicates more, and more quickly, with the left hemisphere than the left hemisphere does with the right;⁹⁰ and the left hemisphere communicates more within itself, while there are ‘more bilateral interactions between hemispheres for the right hemisphere’.⁹¹ The phenomenological world of the left hemisphere is more self-directed, enclosed, self-validating – in thrall to its *theory*; the world of the right hemisphere more open to new information, the bigger picture, and what is actually the case, regardless of what the theory might suggest. All of which adds up to the right hemisphere seeing the relationship between the Master and emissary as co-operative, and requiring both parties, as the Master does in the parable; whereas the left hemisphere, like the emissary, sees itself as not needing (in truth it does not understand) what it is the Master knows. It’s a good servant, but a very poor master.

A map and the world it maps have a one-to-one relationship and each reflects the other’s reality. But the map is not of equal importance with the terrain it maps. Or another analogy: wearing glasses can sharpen your eyesight; but they only work if you have eyes. Relying on the right hemisphere alone could be thought of as losing your glasses, but at least retaining your eyesight; relying on the left hemisphere alone is a little like having your glasses on, but having your eyes tight shut. Oddly, you find there is nothing to see out there.

A narrow focus, serial analytic approach encourages us to think that the way to understand music is to see what is in each note, and then add them together to find out the sum. Or to understand flow by looking at a single molecule of water, or even at a small sequence of contiguous molecules of water, and work out from that what flow really is.

Two main consequences result from this fallacy of reduction to parts.

One is that the search goes in the wrong direction: not upwards, to understand how a phenomenon such as flow functions in the context of everything it takes part in, but downwards, towards units that not only do not exist as discrete entities, but, even if they did, would contain no more of the secret of flow than an agglomeration of single notes explains Beethoven’s *Missa Solemnis*.

The other consequence of the atomistic, serial, linear approach is a futile search for what causes what. As an example, a lot of effort has been, and continues to be, directed at disentangling what it is that the right hemisphere is contributing, when we say it is good at understanding metaphor. Is it its affinity for novelty? For complexity? For the implicit? For understanding utterances in context? Or for seeing the connexion between superficially unrelated elements? Which causes what?

This is a little like asking what explains the cat's success in catching mice. Its swiftness? Its agility? Its visual acuity? The sharpness of its claws? Its habit of going out hunting at night? Which is the primary quality? This is the typical left hemisphere approach: if we can only break it up into bits, we will finally understand it, by stringing the bits together in the right order.

My view is that this will lead to a somewhat unproductive argument. All these are together parts of the whole successful predatory animal that is the cat. No one element is the ultimate cause of the rest. They are part of the flowing process called evolution. (In fact many of the problems that people have with evolution come from seeing it atomistically, rather than as a flow.)

By contrast, we could approach this from the other direction, namely that many things are better understood by observing, not the 'parts', but the whole of which they are themselves part: seeing the *Gestalt*. I see metaphor as one aspect of the way we understand the world, something at which the right hemisphere is comprehensively better than the left, as I shall try to show in Part I. This way of looking also has the consequence that once you understand the coherent whole that is the right hemisphere's world, you can see that it would be odd indeed if the right hemisphere were *not* the better at understanding metaphor.

WHAT IS THE NATURE OF REALITY?

Philosophers in every known culture have debated the nature of reality from time immemorial. While we cannot, in the nature of things, ever pin it down, we cannot give up the search: understanding, like reality itself, is an unending process, not a thing that is finished so as to be grasped. It is the process that offers to enlighten us, not the act of appropriation. ‘It is not incumbent upon you to complete the work’, goes one rabbinical saying, ‘but neither are you at liberty to desist from it.’⁹² The truly foundational aspects of our experience – starting with consciousness itself – belong to the realm of things which permit no ultimate resolution. Indeed, some measure of our understanding of what we are dealing with is, precisely, the awareness that it forever exceeds our grasp. Not to be aware of the limits of our grasp of reality is folly, pure and simple. But, I emphasise, that does not mean that reality is whatever we happen to think it is, or would like it to be.

In an age that prides itself on being capable of resolving and clarifying every aspect of experience in such a way as to explain it, in the hope of controlling it, we are too apt, when faced with a question that cannot be answered, either to deny that the question has meaning, or to deny that the problematic entity exists, or both. It is not just Zen wisdom that is founded on pondering irresolvable questions, and paradoxical injunctions: you scarcely need to be a Zen master to see the deficiencies in the all too common modern Western strategy of ruling questions impermissible, or denying the existence of what we can’t comprehend. The most important questions are, precisely, the unanswerable ones.

In this book I will offer some thoughts about reality from a new perspective. To see this, we need to attempt what Shelley said was the distinctive achievement of poetry, when ‘it strips the veil of familiarity from the world’.⁹³ Imagine, then, for a moment, that it is not our world, but another, that we must explore. There are three questions to ponder, each taking us deeper into the unknown:

- What *means* do we have at our disposal in approaching this world?
- What *paths* should we follow in approaching this world?

- What can we say about the *form, the structure and nature* of this world?

In every case, I am interested to see what the hemisphere hypothesis can tell us.

In Part I, I address the *means* to truth, in the sense of the faculties with which we are endowed for this task. I take these to be: attention, perception, judgment, apprehension, emotional and social intelligence, cognitive intelligence and creativity (what I mean by each term will become clearer in the appropriate chapter). In each case I look at what either hemisphere contributes to the process. And here I hope an approximate analogy may help.

Suppose you are charged with gathering intelligence about a foreign country that has been infiltrated by two agents that continually report back to you. The agents have different skills, and different concerns aligned with those skills, so as to cover the range of information you require: you need to hear from both of them. Because of the exigencies of espionage, only one agent can have access to the transmitting device at any one time, and therefore has the task of reporting on behalf of both of them; each takes on this role at times but not according to any discernible pattern. Two things begin to be obvious to you: that the reports you receive often contradict one another; and that, as subsequent events unfold, some prove to have been highly reliable, others very clearly not. You suspect, rightly, that this is not random, but depends on who is doing the reporting. It thus becomes critical to identify, immediately on receipt, the reporter from which any message comes. Finally a breakthrough is made: computerised lexical analysis reveals there is a linguistic ‘fingerprint’ that enables you to tell whether a report comes from the reliable agent or not. This enables you to know which reports to act on; and from now on your progress is unstoppable.

In looking at each of the various means by which we gather information about the world listed above, as in the story there are two agents involved – the two hemispheres – and they cannot report separately. However, carefully designed experiments, and careful observation of ‘experiments of nature’, such as strokes, tumours and injuries, enable us to see what happens if one or other hemisphere is doing the ‘reporting’. This in turn enables us to do three things. First, we can come to a clear judgment of which is more reliable. Second, we can come to an understanding of why

reality so often appears paradoxical. And third, when faced with two differing accounts of the world, we can tell from the characteristic ‘imprint’ of either hemisphere on each account which is more likely to be reliable. Without, of course, wishing to discount either of them altogether, we can make a shrewd assessment of which we ought to prefer.

There is, naturally, no conceivable analogy for how the person relates to the brain, so do not overinterpret this analogy which is designed to make a limited point only. But if we (a) know which hemisphere is more trustworthy, and (b) can recognise the lexical signature, the ‘fingerprints’, of either hemisphere, we are already at an advantage. If I am right, this is a genuine advance in philosophy. That is the thrust of Part I.

Then comes Part II. Here I address the main *paths* that are open to us to take in our approach to truth. I take these to be science, reason, intuition and imagination. In each case I look at the strengths and limitations attendant on them; and bring to bear philosophical and psychological evidence and argument. I also look at what is contributed in each case by the right hemisphere and by the left.

Part III is the recompense for the painstaking examination of the portals (Part I) and the paths (Part II) whereby we can come to know the world. I look at the nature of the world, as disclosed by each of these paths and all of our faculties, and conclude that it looks nothing like the one that is commonly portrayed, but something far more complex, beautiful and alive – and that has immediate consequences for our understanding of what a human being is.

Against the view that whatever we have come to love, celebrate and honour is ‘nothing but’ something else, I suggest a different view: nothing can ever be ‘nothing but’ something else, because nothing whatever is *ever* the same as something else; that all that exists is more than we could ever be in a position fully to understand; that, far from being much less than we imagine, we are almost certainly far more than we *can* imagine. This seems like a more reasonable, as well as a more modest, proposal than that we know it all, at least in principle (‘some bits round the edges still need a bit of work, but we’ll get there soon, if scientific knowledge and technology keep expanding at their current rate’). In the words of William James: ‘Our science is a drop, our ignorance a sea.’⁹⁴ And that’s no less true now than it was then, since the more we learn, the more we see how much we have yet to learn.

Mallarmé said that poetry should evoke mystery.⁹⁵ So should science and philosophy, if it is true that there are no hard and fast boundaries between the different paths to knowledge, and that the following of all paths to truth leads ultimately to the same place. The wonder of science is not that its clarity reveals how clever we are, but that it reveals, like poetry, a deeper mystery. ‘The more we know’, writes astrophysicist Marcelo Gleiser, ‘the more exposed we are to our ignorance, and the more we know to ask.’⁹⁶

Our dominant value – sometimes I fear our only value – has, very clearly, become that of power. This aligns us with a brain system, that of the left hemisphere, the *raison d’être* of which is to control and manipulate the world. The whole point of its knowing is, simply, the better to control: as Francis Bacon famously put it, knowledge is power. But for us to be satisfied that we have power, the world must be seen to respond to our will, and work according to rules that we can know and operate, whenever and to whatever extent our will dictates. Any suggestion that some things are not amenable to this approach is taken as an affront to the onward march of the human intellect. Odd as it may seem, it is the very same people that view humans as little more than conniving apes that are most vain about their human capacity to know and do. The position seems to be that, however limited, commonplace and unamazing we are, the world is even more limited, commonplace and unamazing, since with all our shortcomings we can understand it. This could be contrasted with the view that marvellous as we are, the world is more marvellous than we have the capacity to understand. As the British nuclear physicist Emerson Pugh put it: ‘If the human brain were so simple that we could understand it, we would be so simple that we couldn’t’.⁹⁷

What I hope for my readers is that, if they are willing to accompany me on this adventure, they will never see the world the same way again; that they will have a *Gestalt* shift, as when this picture of a woman engaged in her *maquillage* is suddenly seen to be a grinning skull:



Fig. 2. All is vanity, drawing by Charles Allan Gilbert, 1892

Except that is a journey from life towards death. Our journey will be from death towards life.

THE MATTER WITH THINGS

*Our Brains, Our Delusions
and the Unmaking of the World*

Iain McGilchrist

• VOLUME ONE •

The Ways to Truth

PART I

The Hemispheres & the Means to Truth

That the nervous system is double physically is ... a very striking fact, but one so well known that we are in danger of ceasing to think of its significance – of ceasing to wonder at it.

— JOHN HUGHLINGS JACKSON¹

This twofold nature of man is so clear that some have thought that we had two souls.

— BLAISE PASCAL²

1. Hughlings Jackson 1874. Hughlings Jackson is generally considered a towering giant in the history of modern neurology, and was one of the founders of the world-leading journal *Brain*.

2. Pascal 1976, §217 (Lafuma §532): « Cette duplicité de l'homme est si visible qu'il y en a qui ont pensé que nous avions deux âmes ».

SOME PRELIMINARIES: HOW WE GOT HERE

Le superflu, chose très nécessaire,
A réuni l'un et l'autre hémisphère.

—Voltaire¹

IF WE ARE INTERESTED IN TRUTH, WE OUGHT TO BE INTERESTED IN THE MIND through which it might be apprehended. To quote Roger Sperry:

Questions such as those concerning scientific truth, the nature of reality, and the place of man in the cosmos require for their study some knowledge of the constitution, quality, capacities and limitations of the human mind through which medium all such problems must be handled.²

And if we are interested in the capacities and limitations of the mind, we should be interested in the capacities and limitations of the brain. This book is my attempt to engage with just such questions through exploration of the extraordinary capacities, and as important limitations, of the human mind, and the brain that is its most direct embodiment.

This and subsequent chapters in Part I contain a certain amount of necessary neurological and neuropsychological detail. I hope that many people will find it as fascinating as I do, but I cannot expect that every reader will. For those who are prepared simply to take my word for it, I will provide a brief summary of the findings at the end of each chapter, that will

suffice to convey the general drift, but inevitably lack the vividness of specific details and descriptions of real patients, as well as much of the nuance. Those who want to know more about the evidence will, I hope, enjoy reading further. In Parts II and III, by contrast, the emphasis will be more philosophical than technical, and the conclusions to chapters there are not designed to act as summaries.

The most technical chapter is this one. If you survive this, you're good to go.

ANCIENT ORIGINS OF BRAIN STRUCTURE

I want to begin with some history: it is how we understand where we are now.

To make sense of hemisphere differences, we need to know how they evolved to be the way they are. Exactly why history took the path it did, as with all history, we can only hypothesise. In what follows I put forward a hypothesis of how and why the mammalian, and ultimately human, hemispheric system evolved to its present form. All I can say is that I know of no competing hypothesis that explains so many of the facts as we know them. And if you agree with my assessment, and follow through to Parts II and III, you will find many long-standing problems in philosophy are – not solved, of course, hardly – but reconceived in a way that might just help us make sense of the world, at a moment when we urgently need to do so.

To begin with, we need to go back long before the advent of the human brain, to the development of the very first nervous system of which we have knowledge. From there we can come forward to consider what happened with the advent of the mammalian, and finally the human, brain. What emerges is something like a dance. And, like many a good dance, it involves couples, their paths sometimes crossing, coming together and moving apart again, in a pattern that, viewed as a whole, makes perfect sense.

As the great English neurophysiologist Sir Charles Sherrington established more than a century ago, the proper working of the body depends on what he called ‘opponent processors’, systems that complement and counterbalance one another by their essentially opposing actions. A very simple example of this would be your arm, which requires not just the biceps, to flex it, but the triceps, to extend it; and the finely calibrated positions that are constantly required in real life can be achieved by employing both, to varying degrees, simultaneously. The nervous system is no exception. The autonomic nervous system, which regulates body functions below the level of consciousness, is divided into the sympathetic system, which prepares the body for action (‘fight or flight’), and the parasympathetic system, which prepares it for repose: again, the finely

modulated states that we require moment to moment are better carried out by opponent processors than one unidirectional system.

In the brain there are three main such pairs of opponent processors, ranged along each of the three spatial axes. There is the top-to-bottom axis: that is to say, the relationship between the cortex – the outermost layer, literally the ‘shell’, of the brain – and the regions which lie below it. (This is called the ‘dorsal-ventral’ axis, but the name is not important here.) There is the front-to-back axis, the relationship between the frontal cortex and the posterior cortex of each hemisphere. (This is called the ‘rostral-caudal’ axis, but again the name is not important.) Finally, there is the lateral axis, that of the two hemispheres. Each one of them involves a relationship of balance, that includes *both* mutual potentiation *and* mutual inhibition. I suggest that in each case the relationship began as one of reinforcement, and that their counterbalancing, or opponent, role emerged directly out of this over time. Intriguingly enough, this opponent role turns out to be far more creative than the merely reinforcing role could ever have been: one of the many themes of this book is the role of resistance in creation; and the working together of opposites.

It might surprise those who believe that the right/left story is an ‘urban legend’ to learn that lateral asymmetry is there right at the very origin of the nervous system. It was not an afterthought. It exists, as I mentioned earlier, in fish, amphibians, reptiles, birds, insects and nematode worms; but in fact the earliest known instance of a nervous system, that of *Nematostella vectensis*, a sea anemone over 700 million years old, already exhibits lateral asymmetry (see Plate 2 [b]).³ The head of the research team who made this discovery, Thomas Holstein of Heidelberg University, called it ‘the birth of centralisation of the neuronal network on the path to the complex brains of vertebrates’; and, he added, ‘the origin of a central nervous system is closely linked to the evolution of the body axes’.

Over evolution, as I described in the introduction to this book, asymmetry of the nervous system has been universally conserved as a means of addressing the problem of how to ‘get’ without being ‘got’. But to appreciate the full importance of laterality, we need to see how it interacts with the other two axes in three dimensions. Let us take a huge step forward, some 500 million years from *Nematostella*, to the first mammals.

With the mammalian brain, things take a whole new step, or series of steps, forward from the reptilian brain. The first mammals appeared in the

late Triassic and early Jurassic period, about 200 million years ago. They were small creatures at first, mouse- or shrew-like, probably nocturnal, living low to the ground, possibly subterranean dwellers. This way they kept out of notice of the much larger, but dumber, reptiles – the dinosaurs – with which they, for a while, co-existed, and which they eventually displaced. And there are, ultimately, three very important things about the mammalian brain, of consummate importance for understanding the nature of the human mind. One concerns the top-to-bottom axis – the development of the neocortex; the second concerns the side-to-side axis – the development of the corpus callosum; and the third concerns the front-to-back axis – the development of the frontal lobes. Each in some way has implications for all of the others. Let's look at them one by one.

First, the top-to-bottom axis.

THE DORSAL-VENTRAL AXIS

What is the neocortex? As its name suggests, it is a ‘new’ development compared with the simpler allocortex, on top of which it sits (see Plate 2[c]). It doubled the number of cortical layers from just three, in reptilian allocortex, to six. Since, broadly speaking, the power of the brain increases with the number of cell layers, the development of the neocortex with the first mammals is a radical shift in brain capacity.

What drove the development of the neocortex, which would one day become the home of all the higher conscious functions of mankind? The simple answer is that no-one really knows. But one likely hypothesis is that to survive in their various ecological niches these small animals had to be smarter than the lumbering creatures alongside whom they lived, and they needed sharper senses and proportionately bigger brains; their tetrapod ancestors had a relatively low-resolution sense of smell, poorer vision and hearing, coarser tactile sensitivity and unrefined motor co-ordination, with little of the cortex devoted to sensorimotor integration.

According to this hypothesis, the first driver of cortical expansion was the need for more sophisticated sensory information: specifically olfaction, and the sense of touch, these being especially significant in nocturnal creatures living close to the ground. The most striking feature of the first mammalian brains is the huge expansion of the olfactory bulbs and tracts.⁴ This was closely followed by tactile sensitivity. The need to conserve heat, given the proportionally bigger surface-to-volume ratio of small animals, made body hair a hugely important development in mammals (you lose heat through the body surface, and smaller bodies have, proportionately, bigger surfaces); but the primary drive may yet have been the extraordinary increase in sophisticated tactile-spatial information a coat of fur affords.⁵ In these early mammals, the neocortex is dominated by ‘a single primary somatosensory field’, mapping sensation from the greatly expanded olfactory bulbs, the skin, hair follicles, muscles and joints.⁶ More accurate sight and sound systems evolved only later,⁷ as did bimanual co-ordination, all of which particularly required close co-operation of the two hemispheres.⁸

In reptiles the equivalent sensory mapping is carried out in the mesencephalon, corresponding to what is known as the midbrain in humans (the midbrain is a small region situated at the top of the brainstem in an area below the hemispheres: see Fig. 3), beneath conscious access, and at a level where there is a well-developed cross-midline connexion, the tectal commissure.⁹ However, possibly because fibres connecting the hemispheres are relatively scarce in reptiles, the projections from there to the telencephalon, the higher, cortical area, lose their topographic organisation – ie, they are no longer, at that level, a map at all.¹⁰

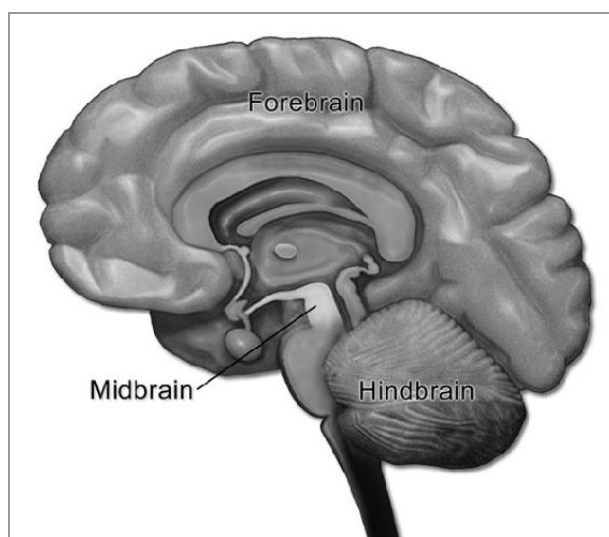


Fig. 3. Sagittal section of the human brain showing the midbrain or mesencephalon

By contrast in mammals there is a map at the neocortical, the most highly evolved, level.¹¹ The development of this high-level map across the whole perceptual field in mammals is a crucially important step in the capacity for complex awareness of the world and the ability to make quick, subtle and accurate responses to it, the whole purpose of the elaboration of the vertical axis. What it required at this stage, above all, was the ability to *integrate* information, a process that could not be achieved across the relatively sparse connecting fibres of the upper levels of the reptilian brain. Clearly what mammals needed was a ‘superhighway’ connecting the two cortices. And this is where the corpus callosum comes in.

Thus the development of the *vertical* axis, for superior sensory mapping of the world, necessarily required strengthening the *lateral* axis. At first the corpus callosum would be there simply to facilitate. But remember there was, all along, a good evolutionary reason for separation: later it would become both a facilitator and an inhibitor, an all-in-one opponent processor. Similarly, at first the neocortex was simply doing more of what the allocortex did, and doing it better: it came, as these developments all did, in the service of enhancement of *already existing* cortical functions. Later, it would expand its repertoire vastly and come to be both a facilitatory partner and an inhibitory one – an opponent processor, exerting a downward inhibitory effect on the reptilian brain.

So, to the lateral axis.

THE LATERAL AXIS

The corpus callosum, then, just like the neocortex, is a mammalian invention.¹² To be precise, it is confined to placental mammals, since marsupials (effectively kangaroos, wallabies and opossums) and monotremes (egg-laying mammals, like the echidna and platypus) do not have a corpus callosum, any more than fish, amphibians, reptiles or birds: in its place they have anterior and posterior commissures, which are somewhat more substantial than in most mammals, in which they have now become fairly exiguous relics. But even these larger commissures are very slim indeed by comparison with the capacity of the corpus callosum.

I should note here that the callosum is often misunderstood not only as a unifying force, which it clearly often isn't, but also as the only means of communication between hemispheres, which it never is. The anterior commissure in humans, although very much smaller than the callosum (about a fiftieth to a hundredth the size), does transfer some information between hemispheres, and to an even smaller extent the slender posterior commissure does, too, though it is mainly concerned with pupillary reflexes. And even if these are cut, there is still subcortical communication by means of the brainstem and almost certainly the cerebellum. What's more, every single motor act initiated in one hemisphere gives thereby proprioceptive and visual feedback to the other hemisphere. And they share the influences of hormones through the blood supply, and of cerebral peptides through the cerebrospinal fluid, both of which, though slower-acting, are as important as neuronal communication for regulating mental states. So, even without the corpus callosum, the two hemispheres are not completely isolated.

However, the callosum remains by far the most immediate way in which the two hemispheres of the human brain interact, and it is the mediator not merely of connexion, but of hemisphere specialisation, as I will suggest.

It is thought that the callosum came into being in order to enable gaze pursuit of fast-moving objects across the midline, and to reinforce, more generally, perception in all modalities at, and around, the midline of the attentional field.¹³

But just as all the wealth of functions subserved by the human neocortex could not easily have been foreseen from its early expansion in the service of the sense of smell, the future uses of the corpus callosum can hardly be prefigured simply from the need to stitch together the midline of attention.

As the brain grew (and, as I say, mammals have proportionately much bigger brains than other animals), two things happened, which pulled in opposite directions. On the one hand, there was clearly a huge increase in the amount of information that needed to get across from one hemisphere to the other. But simultaneously, on the other, and for equally obvious reasons, the distances to be travelled were greater. This slowed down transmission. So what could be done about it?

One answer was for neurones projecting to the contralateral hemisphere, as far as possible, to shorten their route. This meant that fibres that, for instance, used to loop forward, cross to the other hemisphere, and then have to loop backward again, took a shorter path, nearer the middle of the brain: the initially slender hippocampal commissure began to be the route for more and more interhemispheric fibres, and eventually developed into the corpus callosum.¹⁴

The other answer was to increase transmission speed – to get ‘a faster cable connexion’. For this, the neuronal axons needed to become both thicker and sheathed in myelin. This is because thicker fibres and, even more, myelinated fibres, transmit faster (myelin is white, and is what differentiates white matter from grey).

But thicker fibres, which are then further increased in diameter by being encased in myelin sheaths, take up space – not just in the corpus callosum, but throughout the brain. A comparison of the fibre diameters in the corpus callosum of mouse and monkey suggests that the thickness of the fibres does not increase sufficiently to compensate fully for the longer distances in larger brains.¹⁵ Moreover, if brains were to remain proportionately interconnected as the number of neurones grew, the number of neuronal connexions of all kinds, inter- and intra- hemispheric, would have to grow *exponentially*. This is not only impossible, because of the external constraint of head size, but is self-defeating, because of increasing conduction delays. As the brain grows, then, and with it the complexity of its tasks grows, there has to be a trade-off. There comes a point where interconnexion must be limited.

One of the ways in which the need for interconnexion could be spared would be by *specialisation* of cortical areas. That way, only ‘results’ of (what would increasingly become) more local processing would have to be transmitted.¹⁶ In other words, functions could be delegated, and only what needed to be known outside of the area of delegation would be shared. Large administrative organisations are sometimes criticised, no doubt justly, because ‘the left hand doesn’t know what the right hand is doing’, but a degree of mutual ignorance is indispensable, provided the important outcomes are communicated.

And this is indeed the course that nature has taken.¹⁷ Cortical areas become more distinct as the mammalian brain has become more complex.¹⁸ The brain of the rat is small and its cortex is relatively unspecialised; the much bigger brain of the monkey has a cortex that is highly specialised.¹⁹ And, for example, the visual cortex of a cat is less specialised than that of a monkey and therefore more strongly influenced by other than visual – say, auditory – stimuli.²⁰ Generally the number of distinct cortical areas increases with brain size.²¹

Clearly, once initiated, this is a self-reinforcing process. More specialised units need to communicate less; with less communication, they become more specialised.

And this, in turn, has an effect on the corpus callosum. It does not simply require a decrease, or an increase, in its importance. It requires a change of function. What it means is that the callosum, too, needs to differentiate and *specialise*. Conduction times short enough to support common activity in both hemispheres are possible in only a few instances, not in all, and must therefore be sparingly allocated.²²

Bear with me while I make some distinctions. More connexion can mean more connexion – or *less* connexion, depending on whether the purpose of the first connexion is to say yes, or to say no.

The corpus callosum has both inhibitory and excitatory functions, depending on the areas involved and the nature of the task.²³ In humans only 2% of neurones in either hemisphere have fibres that cross the corpus callosum, so there is already considerable functional independence. Additionally while the majority of fibres that cross are in themselves facilitatory (employing the excitatory neurotransmitter glutamate), many of these connect with interneurones which employ the inhibitory

neurotransmitter gamma-aminobutyric acid (or GABA, for short), so that their overall effect is to inhibit.²⁴ So it is that we find that only a small population of large-diameter fibres continue to increase their diameter in species with larger brains.²⁵ These are the essential sensorimotor tracts that enable co-ordination across the midline of the attentional field – which was the earliest pressure, after all, for the evolution of the callosum.²⁶ It is here that speed is of ultimate importance. Indeed of all sensory input, integration across the corpus callosum of auditory and visual modalities is the most highly conserved, with high-resolution processing of central vision making possible accurate depth perception, and binaural cells generating a cortical sound localisation system: a sort of ‘sensurround’ experience.²⁷

For the rest, by contrast, most areas do not require the same urgent co-ordination, whether inhibitory or excitatory – especially where excitatory: the higher-order processing areas, involving more sophisticated cognitive functions are connected by smaller diameter, weakly myelinated, slower communicating, axons.²⁸ The overall effect is that when it comes to sensory and motor information, connectivity between homotopic regions (the ‘mirror image’ regions on either side) serves to co-ordinate the hemispheres in action; but where the most cognitively complex activity is going on, in the heteromodal association areas, communication is less important – unless it is actively to *suppress* one side or the other.²⁹ For, here’s the point: given specialisation and differentiation, one thing callosal tracts need to ensure is a sufficient degree of *non-interference*.³⁰ And that means there must be mutual inhibition. A balance between imparting information, at the sensorimotor level, and inhibiting premature involvement, especially at the cognitive level, needs to be struck.

Inhibition is creative. Here it leads to independence. Inhibitory interneurons are critical to normal functioning across a whole range of activities in the human cerebral cortex.³¹ The great Spanish neuropathologist Santiago Ramón y Cajal, sometimes referred to as the ‘father of modern neuroscience’, believed that the extraordinary power of the human mind was primarily dependent on the increase in the number and diversity of cortical *inhibitory* interneurons, many of which he was the first to identify: the power of opposites – ‘opponent processors’ – once again.³² The cortex of primates has many more, and a greater variety of types of, GABA neurons, reflecting greater sophistication of inhibitory

functioning, than the cortex of any other mammalian order.³³ In fact interneurons, most of which are inhibitory, constitute about 25–30% of the entire neuronal population in the cortex of primates.³⁴ And, within primates, the largest and the most numerous such interneurons, and the largest number of types of inhibitory neurons, are found in humans.³⁵

The evolution of larger brain size in primates, not just in humans, results in increasingly independent hemispheres.³⁶ This arrangement is more efficient for two main reasons: first, the avoidance of interference, especially in complex cognition; and second, a potential doubling of working capacity.

As regards the first, with age, for example, the corpus callosum of the human brain loses some of its capacity for interhemispheric inhibition, causing slower performance due to mutual interference.³⁷ Such interference may also underlie some aspects of psychopathology, as in schizophrenia, where transcallosal inhibition is less efficient.

As regards the second, when task requirements are demanding, performance is enhanced by distributing processing between the hemispheres,³⁸ both in split-brain patients³⁹ and in healthy volunteers.⁴⁰ Even when the tasks are simple, but conflicting, as in adding and subtracting at the same time, engaging both hemispheres independently is more efficient.⁴¹ Callosotomy patients are able to scan visual arrays for targets separately, thus being twice as efficient as normal subjects.⁴² They are also better able to carry out ‘mutually conflicting volitional decisions’.⁴³ Children of 10 are less able to use hemispheres separately than children of 12 and upwards: as a result older children can capitalise on using both hemispheres independently to solve problems.⁴⁴ Greater interhemispheric connectivity in girls was found to be associated with slower performance and with lower verbal IQ.⁴⁵ Greater hemisphere independence is associated with superior performance: ‘importantly’, as one research group report, ‘the magnitude of lateralisation [of functions] ... predicted the level of cognitive ability’.⁴⁶

By inhibiting the overall activity in one hemisphere, the corpus callosum may allow the other to take over for tasks more suited to its mode,⁴⁷ and thus maintain independence of the two hemispheres.⁴⁸ As activation builds in one hemisphere, the homologous region in the other hemisphere is inhibited:⁴⁹ stimulation of neurons in one hemisphere results

in an initial excitatory response in the homologous region in the other hemisphere, followed by a more prolonged inhibition.⁵⁰ These effects can be demonstrated on imaging.⁵¹

While theories have supported both what are described as ‘co-operation’ and ‘competition’ models of the relationship between hemispheres, these are not incompatible. It is clear that both are involved; and working separately, just as working together, can be in the service of greater efficiency.⁵²

In some respects, however, the hemispheres do seem to be in straightforward competition.⁵³ It has been observed since the late nineteenth century that the effects of a lesion in the central nervous system on one side may be paradoxically alleviated by a lesion in the corresponding position on the other.⁵⁴ For example, following a stroke affecting the speech area of the left frontal lobe, known as Broca’s area, improvement can result from temporarily disrupting the corresponding area of the right hemisphere.⁵⁵ Such studies ‘are difficult to understand in terms of traditional ideas that homologous cortical regions co-operate with each other across the midline.’⁵⁶ This is in keeping with my observation that in brains that have lost normal asymmetry the pathology is usually not that an expansion in a critical area of one hemisphere failed to take place, but that a failure to *inhibit* expansion in its contralateral homologue (the ‘mirror image’ location) occurred in the other.

But there is an asymmetry – of course! – in the relationship between the two hemispheres. In general, the right hemisphere communicates both more, and more quickly, with the left hemisphere than the left hemisphere does with the right.⁵⁷ This is exactly what one would expect if the right hemisphere is superior in perception, and more aware of what is going on: it’s more urgent that the left hemisphere learn from the right, than that the right hemisphere learn from the left.

However, it is not that the right hemisphere relatively neglects internal communication compared with the left. The right hemisphere is *both* more mutual *and* better integrated within itself. It has repeatedly been shown that, in the resting state of the normal brain, there is in general greater connectivity and coherence in the right hemisphere – both greater integration of information within the hemisphere, and a greater degree of interhemispheric transfer.⁵⁸ This is significant. In the words of Andrei

Medvedev of Washington's Center for Functional and Molecular Imaging, this provides 'the anatomical and functional basis for the existing view that the left hemisphere is more involved in analytical and sequential processing while the right hemisphere is more involved in integration and synthesis.'⁵⁹

Hence we have the fascinating phenomenon whereby the corpus callosum arises (relatively) late in evolution, but cannot keep pace with growth in brain size, and becomes actually smaller, in proportion to the volume of the brain as a whole, as evolution progresses. The number of callosal fibres gets proportionately smaller, both as the brain gets bigger,⁶⁰ and as it becomes more asymmetrical.⁶¹ In fact, as a general rule, the higher the species on the phylogenetic scale, or the more mature the individual organism, the more restricted the commissural connexions.⁶² And specifically in humans, there is a marked decrease in the rate of growth of the corpus callosum when compared with intrahemispheric white matter tracts, the long tracts that help draw together processes *within* each hemisphere.⁶³ (See Plate 3[a].)

The corpus callosum itself comes to embody the predicament of the entire cortex, and ultimately of the human world: how to hold things together, and yet keep them apart. Another theme of this book is the importance of union and division *together*.

Before we come to what this distancing of the hemispheres means for the human brain – because it has a very particular meaning and trajectory in man, which is of outstanding importance – let us look at how this intersects with a change that takes place in the other remaining axis, the front-back axis plane. And in doing so we need once more to come forward in time.

THE ANTERIOR-POSTERIOR AXIS

One of the differences between great ape brains, including human brains, and those of most other mammals is the expansion of the frontal lobes. In an intelligent animal such as the dog they account for about 18% of the brain; in monkeys about 30%; in the great apes about 35%, and in humans about 37% of the entire brain (the main difference between our brains and those of the other apes is that ours have more white matter – increased functional connectivity).⁶⁴ And what is the frontal cortex for? Largely for stopping things happening.

To members of a society in which doing things is much more highly valued than desisting from doing things this might seem paradoxical. Yet this negation is highly creative. It puts ‘necessary distance’ – in time and space – between ourselves and the immediacy of experience, so as to take the broader view, contextualise, test hypotheses and plan for the future. This enables us to stand back and see things in perspective, to choose whether or not to give in to the immediate reaction, or to see things in a different way, and respond more effectively; it enables us to delay gratification in order to achieve a greater end. It enables us to see our fellow creatures not merely as enemies but as potential allies; to see others, for the first time, as beings like ourselves, with needs and wants similar to our own. There is a proper distance between ourselves and the world which enables us to see what is going on: it is like trying to read a book – too close and one cannot see anything, too far away and one cannot make out the text. And this is true of all human experience, including those aspects that are, of all, the ‘closest’: our relationships with others we may love. They all require and benefit from necessary distance.

Thus if the relationship of the frontal and posterior cortex is antagonistic, yet it is in pursuit of the same goals. Negation is not by any means merely ‘negative’. Relationships can be understood only through images or metaphors, and the best one I know for understanding this particular relationship is the well-known one offered by Hegel. The bud gives way to the flower, which is the fulfilment, and yet the repudiation, of the bud; the flower gives way to the fruit, which is the fulfilment, and yet the repudiation of, the flower: and so evolution continues, constantly

‘negating’ (though not in any important sense truly denying the importance, or the meaning, of) the step that comes before it. This process, which Hegel refers to as *Aufhebung* (unhelpfully translated as ‘sublation’, and meaning something like ‘lifting up’, but also ‘suspending’, or even ‘transcending’), means the carrying up into a higher realm of something that is not, in truth, negated, but in fact fulfilled, by its own relinquishing of being *at that lower level*. Thus apparent opposites (according to the linear, left hemisphere way of thinking), elements in sequence, often turn out to collaborate in fulfilling their ends. Things and their opposites depend on one another for their being, bring about something new through their opposition, and ultimately co-create the world. They are dipoles.

In discussing what we think of as opposites I will frequently use the term dipole, which, according to the OED, is ‘a pair of non-coincident equal and opposite electric charges or magnetic poles ... an object, esp a molecule, atomic particle, etc, having such charges or poles’. Similar dipoles are threaded through the fabric of things.

Each hemisphere, of course, has its frontal cortex – but the distance from the world it offers will have a different purpose and effect in each hemisphere’s case.

Let’s take the right hemisphere first. If its *raison d’être* is to enable us to be on the lookout for potential predators, to form bonds with mates, and to understand, and interpret the living world around us, the role of the right frontal lobe is likely to be to provide the distance that enables us to do this more effectively. It will be involved (along with the posterior cortex of the same hemisphere) in everything that makes us, as Aristotle called us, the ‘social animal’. The distance it provides will stop us jumping to conclusions, for one thing: not all creatures are necessarily hostile or in competition, and distance enables us not just to bite. It must enable us to feel empathy, feeling our way into what it is like to be another; to interpret social signals such as humour or irony, oblique and intuitive signals from face and posture and tone of voice; and enable us to make sense of the world around us – to see the connexions. It must be able to integrate experience over time through memory. It must be in touch with reality here and now, as well as alive to one’s personal past and all that it teaches us. The right frontal cortex will facilitate the closest possible knowledge of the terrain. It will facilitate the human desire for exploration of the world. It will prove the seat of intelligent co-operation.

Similarly with the left hemisphere. If its *raison d'être* is to enable us to be effective predators, the role of the left frontal lobe is likely to be to provide the distance that enables us to do this more effectively. It will be involved (along with the posterior cortex of the same hemisphere) in everything that makes us, as Benjamin Franklin, the father of utilitarianism, called us, the 'tool-making animal' – manipulating the environment, hunting our quarry, getting what we need from it. It will enable us to hypothesise about the consequences of actions. It will develop emotional distance from the other: enable us to stand back and plan, to develop a strategy, to understand another's likely thought processes, not so much to empathise with, as to outwit, him. It will be focussed not so much on the past as on the future. In order to do this it needs to go 'offline', if you like, from the real world, and be able to consider various possible courses of action in a virtual fashion. For this, reality needs to be drastically simplified, 're-presented', rather than actually present (with all the obfuscating complexity that would bring with it): it needs to be *mapped*. The left frontal cortex will facilitate knowledge, not of the terrain, but of the territory. It will facilitate the human desire for exploitation, more than exploration, of the world. It will prove the seat of intelligent competition, rather than co-operation.

With the advent of language, especially, being able to go offline creates a relatively abstracted and virtual world alongside the immediate world of perceptual experience. And clearly they have to be kept apart and yet together if each is to work efficiently. Insufficient separation of function results in an impairment both of tasks preferentially undertaken by the left hemisphere and those preferentially undertaken by the right hemisphere,⁶⁵ but especially the latter.⁶⁶ In other words, given the opportunity, the left hemisphere's functions tend to dominate those of the right: the emissary usurps the Master.⁶⁷

The most ancient difference between the two hemispheres lies in two kinds of attention. And so does the most highly evolved difference, enhanced by the frontal lobes. The more focal attention is narrowed, the more it takes its object out of the realm of time, space, the body and emotion. A virtual world is merely the conclusion of that process – and that is where the evolution of the left hemisphere leads: to a *virtual* world. Quite how true this is will become apparent in the subsequent chapters of Part I.

SUMMARY

Asymmetry about its 3-D axes is a fundamental element of every nervous system, however ancient, of which we have knowledge. In mammals there have been changes in each axis that interlock with changes in each of the others. The corpus callosum, the band of fibres connecting the two hemispheres, which is peculiar to mammals, began by facilitating the working together of the hemispheres in sensorimotor tasks. As the brain grew larger, physical constraints on size required interhemispheric communication to be more selective, and hence impelled intrahemispheric specialisation in higher cognitive functions. The current role of the corpus callosum is at least as much to do with inhibition – keeping the hemispheres independent – as with facilitation – keeping the hemispheres working together. With the expansion of the frontal lobes and the invention of language, the need to pay the greatest possible attention to the world, on the one hand, and yet at the same time ‘go offline’ to manipulate symbols and data in a virtual world, on the other, has resulted in divergence of the hemispheres. As a consequence of this, as we will see in subsequent chapters, the right hemisphere is more in touch with reality, and the left hemisphere more concerned with the internal consistency of whatever virtual model of the world it happens to be working with at the time.

ATTENTION

Our world view is not simply the way we look at the world ... world views create worlds.

—*Richard Tarnas*¹

The question is not what you look at, but what you see.

—*Henry Thoreau*²

‘AS A MAN IS, SO HE SEES’, WROTE WILLIAM BLAKE.³ WHO WE ARE, THEN, determines how we see. And how we see determines what we find. Given that the hemispheres ‘see’ differently, how reliable is each hemisphere in its disclosing of the world? What elements does each contribute to reality?

One way to get a handle on this is to take a look at what happens when there is a degree of impairment in the functioning of one hemisphere at a time – either through illness, accident or temporary experimental inactivation. Damage to which hemisphere has the more catastrophic effect on our experience of the world?

In Part I, I will deal with hemisphere differences in relation to what one might call the ‘portals’ of access – ways in which we get a handle on reality. And in this chapter, I examine the all-important role of attention. Attention is not just another cognitive function. Attention is how our world comes into being for us. The altered nature of attention can appear to

abolish parts of the world, collapse time and space, eviscerate emotion, and render the living inanimate. It is a profoundly moral act.

Though attention and perception are importantly different, there is bound to be some overlap, since abnormal attention leads to abnormal perceptions, and vice versa. In turn perceptions inevitably involve making judgments. So this and the two succeeding chapters, on perception and judgment, should be seen not as entirely separate, but as one continuous process of helping the reader appreciate the extent and importance of hemisphere differences as they unfold before our eyes.



It is fair to say that, though the main deficits incurred by damage to the left hemisphere are in the twin important areas of the use of language and of the right hand, the world itself usually remains recognisable, and mainly, though not always wholly, undisturbed. That is because the right hemisphere is functioning as normal.

Things are very different when the damage is in the right hemisphere, and the subject is more – or wholly – dependent on the left. When those who care for left hemisphere stroke patients were asked to specify the most important problem encountered, they named difficulty writing or spelling; by contrast, when those who care for right hemisphere stroke patients were asked, it was loss of empathy. Almost half of carers for those with right hemisphere stroke reported as among the most important problems a whole range of cognitive and emotional impairments, as well as alterations to personality. Not one of the carers for left hemisphere stroke sufferers did so.⁴ For those with right hemisphere damage, they and their world had changed. For those with left hemisphere damage, they and their world were recognisably the same: it was their ability to handle it, to make use of it, that had altered.

As we have seen, the foundational difference between the hemispheres lies in the way they attend – and how you attend changes the world. It also changes you, the one who is doing the attending. Since it is of such consummate importance, let's take a closer look at attention from a hemisphere point of view.

The first thing to make clear is that there is a very substantial body of research over several decades indicating that the right hemisphere has by far the greater control of attention *in general*, as well as for switching attention.⁵ It is a familiar fact that, in right-handers, speech lateralises to the left hemisphere in almost all cases. What is not so well appreciated is that attentional dominance lateralises even more strongly to the right hemisphere than speech does to the left; and left-handers still display right-hemispheric attentional dominance in 81% of cases (a greater proportion than those still showing left-hemispheric language dominance).⁶

Obviously both hemispheres attend to the world and receive information principally from the contralateral attentional field; and we have already come across the difference in quality of attention in either hemisphere. It is well established that the right hemisphere has a special role in sustained attention and vigilance over extended periods of time.⁷ It is the right hemisphere, not the left, that in normal subjects maintains alertness during a task.⁸ But the right hemisphere can also attend in a focussed manner, characteristic of the left hemisphere, if required; whereas the left hemisphere cannot attend in the manner characteristic of the right hemisphere, even where necessary.⁹ Within the single left hemisphere, ‘it is not possible to have access to global and local information interactively.’¹⁰ When attentional demands increase, in whatever way, the right hemisphere tends to take over for the whole field.¹¹ Merely increasing attentional demands above the level of passive viewing – eg, a requirement to detect changes or discriminate complex forms – also increases involvement of the right hemisphere by comparison with the left, and in direct proportion to the demands of the task.¹²

In callosotomy patients, the right hemisphere is much better at sustained attention tasks,¹³ whereas the left hemisphere has a tendency to ‘space out’ for seconds (sometimes 15 or more) at a time.¹⁴ In a classic paper, Stuart Dimond wrote:

The performance of the left hemisphere is one full of gaps or holes, during which it is unresponsive to information presented from the external world. The left hemisphere is disengaged for what probably amounts to a large proportion of the time ... It may be that during these periods the left hemisphere simply falls inert and ceases to

retain its ‘awareness’, consciousness being diminished, but another explanation could be that ‘distractibility’ is a property of the left hemisphere ... The most striking phenomenon was the gap where ten consecutive signals were presented spanning a time interval of fifteen seconds and still the patient, although retaining completely adequate fixation, utterly failed to respond. Lapses of this duration were never seen on the right hemisphere but occurred with increasing frequency on the left.¹⁵

This is in a split-brain patient, granted. But nonetheless, following callosotomy, attention persists in the right hemisphere, ‘although somewhat diminished’, while the left hemisphere is ‘robbed of the power of concentration’ altogether.¹⁶ What happens to the world when the broad, sustained – and therefore sustaining – attention of the right hemisphere is compromised?

If attention grounds the world we experience, this difference should be of profound significance; to appreciate just how profound, read on.

We know that when we are highly focussed on a single aspect of a situation we can miss the most outrageously obvious events happening right under our noses. One of the most celebrated demonstrations of this is a short video clip called ‘Gorillas in our midst’, showing a basketball game in a relatively confined indoor setting.¹⁷ You are asked to count how many times one team passes the ball. When asked afterwards, most observers are completely oblivious to the fact that a figure in a grotesque gorilla suit walks into the middle of the mêlée, turns to face the camera, beats his chest with his fists, dances a jig, and strolls nonchalantly out the other side of the picture – something so comically blatant on second viewing, once you know what to expect, that it is hard to believe you could really have missed it. You were just too focussed on target. And research reveals that, when it comes to detecting unexpected change, the left hemisphere is relatively blind compared with the right hemisphere.¹⁸

A similar phenomenon can be demonstrated by another experiment, which has been often repeated. A stranger asks for directions from a passer-by and holds out a map. Two accomplices of the ‘stranger’, carrying a door (or something similar), walk between the two, and while the passer-by is trying to find where they are on the map, the stranger is substituted by one

of his accomplices. Most people, when they look again at the ‘stranger’, fail to notice the substitution, even when the size, age, hairstyle, race or even the sex of the stranger changes – or all of these.¹⁹ Focussed attention, the only kind the left hemisphere can offer, makes us blind to almost anything, however arresting and however close, that happens to be going on outside our sphere of concern at that moment in time.

But this is compounded by a second problem with left hemisphere attention. The right hemisphere is sensitive to the whole picture in space and time, background and periphery, while the left hemisphere is focussed on what is central in the field of vision and lies in the foreground.²⁰ This follows from the right hemisphere’s need to get a full understanding of the world, as far as is possible, while the left hemisphere needs to manipulate or grasp a prominent part of it. It is nonetheless quite a revelation to realise that so focussed is the left hemisphere on what it is up to, that it is content to ignore all that is irrelevant to its purpose – *grasping*; all that part of the world not available to its grasp, it leaves to the right hemisphere. As a result, when the left hemisphere is damaged, a whole world is still preserved by the intact right hemisphere; but when the right hemisphere is damaged, only the right half of the world remains, courtesy of the left hemisphere – in fact, ultimately much less than half, as we shall see.

Imagine, if you can, what life is like for a patient of mine who we’ll call Mike, an educated middle-aged man, an actuary, whose intellectual faculties are sharp. Since he sustained a stroke in the right parietal region, he lives in only half a world. Looking straight ahead, he is aware of everything to the right of him clearly, but of little or nothing to the left. Reading a book or newspaper, he seems to take in only the right page, or only the right side of the page, and ignore the rest. If I ask him to draw his house, he will draw the right-hand end only; when asked to draw a clock face, he will start off well, but approaching the bottom of the clock he will stop prematurely there at 6, or, if the numbers go on, allow them to spill out of the clock face down the right side of the paper. If someone stands to the left of him, he seems unaware that he or she exists. He behaves as if there simply is no left side to his body; he will wash and shave only the right half of his face. He eats all that’s on the right of his plate and leaves everything to the left, so that his plate has to be turned round by his wife.²¹

Surely there must be something wrong with his eyesight? No, his vision is fine: both eyes and his visual cortex and the tracts that connect them are

functioning normally. How can that be?

This curious state of affairs is a disorder not of the senses, but of attention, called ‘hemineglect’, or sometimes just ‘neglect’. Although the condition is a very common consequence of a stroke in the right hemisphere, it rarely follows one in the left: ‘most cases of right neglect [ie, following left hemisphere damage] resolve relatively quickly and the overwhelming majority of patients showing chronic bias has right hemisphere damage.’²² It can be reversed by global stimulation of the right hemisphere using a well-validated technique known as caloric vestibular stimulation, which involves irrigating the left ear with ice water.²³ As if to underline that the problem has nothing to do with eyesight, or indeed any of the senses, neglect of the left hemispace can be found in some form in all of the sensory modalities: sight, hearing, touch, proprioception (the internal sense of position and movement of the body parts), and even smell.²⁴ It leads to a failure to take into account half the world.

Incidentally, the case of the sense of smell is remarkable in a way that is highly relevant to the point I am engaged in making. While all the other sensory modalities are appreciated by the *contralateral* hemisphere (other side), olfaction alone is appreciated better by the *ipsilateral* hemisphere (same side) – ie, it doesn’t, at least initially, ‘cross over’.²⁵ Since the left nostril has little or no direct sensory input to the right hemisphere, and since it is the right hemisphere that is damaged, one might assume – wrongly – that left-sided olfaction would be spared. But that is, precisely, to misunderstand the nature of the problem: to see the problem as at a purely sensory level. The problem arises at the level of the whole world *coming into being* – or, as in this case, *not* coming into being.²⁶

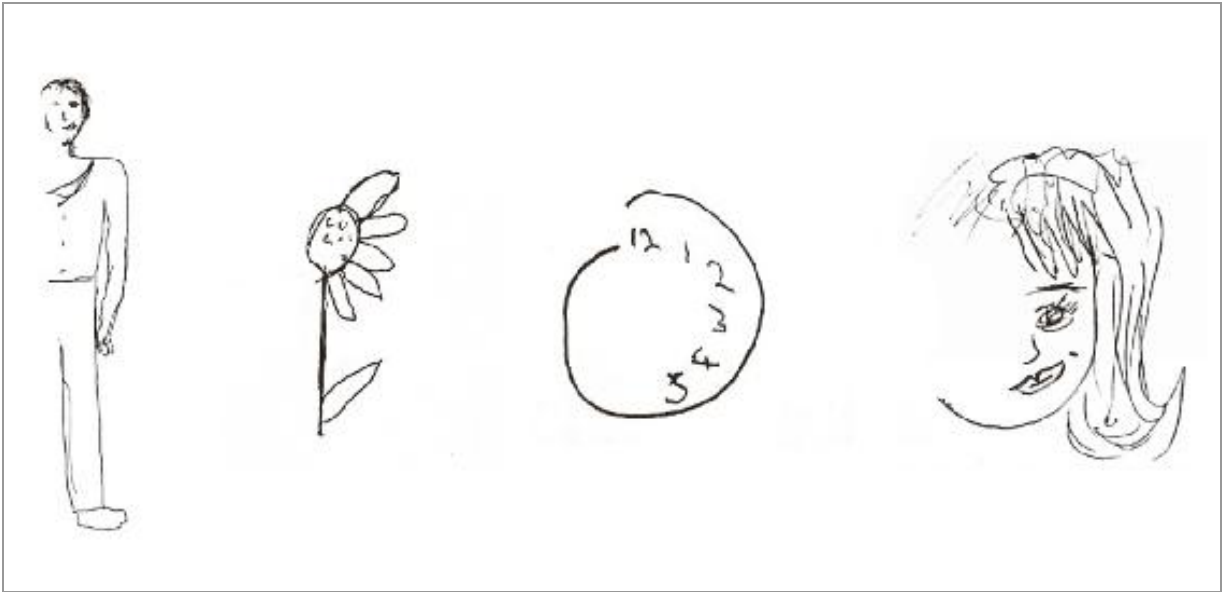


Fig. 4. Drawings of the author, a flower, a clock, and a girl's face by patients exhibiting neglect. The girl's mouth suggests possible accompanying prosopometamorphopsia, another right hemisphere deficit condition (from clinical material of the author (1–3): fourth untraced)

This problem is exacerbated by the fact that the left hemisphere's attention is narrow at the best of times, even as regards its favoured right side of the attentional field. In normal subjects the extremes of space are supplied by the right hemisphere, even the extreme *right* of space.²⁷ So patients with neglect, secondary to a right hemisphere stroke or injury, also often exhibit not just a neglect of one half of the world, but simultaneously a narrowing of the window of attention paid to the part that remains.

And then there is a third problem. This concerns the fact that the right hemisphere's attention is maximally flexible, whereas the attention paid by the left hemisphere tends to be 'sticky'.²⁸ Following right hemisphere damage, particularly damage to the right parietal region, patients find their gaze pulled, despite themselves, towards the right – particularly towards static, inanimate objects in the right visual field – and they are unable to let go.²⁹ (Familiarity, instead of causing it to disattend, causes the left hemisphere to attend all the *more*). A patient of mine with a right temporoparietal lesion became fixated by screws in the hinges on his right when he was passing through a door, and would find himself stuck, staring at them protractedly, unless actively disengaged by one of his carers. (This also happens in schizophrenia: eg, one patient's main complaint was of

getting ‘fixed’ on items such as light switches, posters, radiator taps, fire extinguishers, houses at the end of a long row, other people’s left ears – always on the right side of his field of vision.³⁰) This abnormal fixation towards the right is not, however, itself the *cause* of visual neglect, because, remarkably enough, it is found in neglect patients when they are in a completely darkened room, where nothing is present that could attract and engage the subject’s attention, and asked to look for a non-existent visual target.³¹ Staring is a special kind of vision, in itself predatory: left hemisphere attention gets locked onto its target. As a result it more easily misses everything else.

This is yet further compounded by a fourth phenomenon known as the ‘attentional blink’. This refers to the fact that, after locating a target, there is a refractory period of usually between 200 and 400 milliseconds before one is able to register the next target. This is a normal phenomenon. But in hemineglect, and other right hemisphere deficit conditions where the usual counterbalance is lacking, attention is so ‘sticky’ that it takes about three times longer to disengage from the first target so as to spot the new one – which is therefore often missed.³² (Again, this aspect of attention is abnormal, too, in schizophrenia, being both prolonged and more extreme in effect than in normal subjects.)³³ As the researchers who discovered this noted, this means that visual neglect is a disorder of directing attention in *time*, as well as *space*.

And finally there is a further, fifth, phenomenon. It has long been debated whether we can conceive of, or, in a stronger version, even be aware of, things for which we have no words: the so-called, largely discredited, Sapir-Whorf hypothesis.³⁴ An interesting piece of research suggests that language does interfere with perception in the left hemisphere (the right visual field), but not in the right hemisphere (left visual field). The authors conclude that ‘it appears that people view the right (but not the left) half of their visual world through the lens of their native language, providing an unexpected resolution to the language-and-thought debate’.³⁵ If this is the case, it suggests that there may be still greater constraints on what the left hemisphere ‘sees’ compared with the right.

THE DISTINCTION BETWEEN ATTENTIONAL AND SENSORY DEFICITS

How a problem with attention differs from a problem with vision can be nicely illustrated. There is a condition, called homonymous hemianopia, in which there is damage to the optic tract, and here the patient becomes truly blind – not inattentive – to most of one half of the world. But if you compare a person with left homonymous hemianopia with one with left-sided neglect, the differences are marked.

The person with the hemianopia is only too well aware of what he is missing: the left half of the world still exists for him, he just can't see it easily. He turns his head so as to bring what he wants to see into the right field of vision. But not so with my patient Mike.

Compare these two exchanges, recorded by Georg Kerkhoff, one with a hemianopic patient and one with a neglect patient. Both patients had objective difficulties in reading as well as in visual exploration of the environment. First, the patient with the visual disturbance, homonymous hemianopia (HH):

Examiner: Have you noticed any changes in your vision since you fell ill [right posterior infarction]?

HH: Yes, my eyesight on the left is bad; and I can't read as well as I used to.

E: How would you describe your reading problem?

HH: It is just slower than before and more stressful. Sometimes I omit words at the beginning of a line. Often I realise it only when I get to the end of a sentence and it does not make sense. Sometimes when I get to the end of a line I can't find the beginning of the next. Or I skip a whole line.

E: Have you any other problems with your vision?

HH: Yes, sometimes I don't notice people on the left till too late, and then I bump into them.

E: What's your sense of direction like when you go out?

HH: It's bad, and when there's a lot going on it takes a lot longer for me to find things, especially when they are on the left.

Now compare with the patient with the attentional disturbance, neglect (N), answering the same questions:

E: Have you noticed any changes in your vision since you fell ill [right middle cerebral artery infarction]?

N: No, none that I know of. Except – there's something not quite right with my glasses.

E: Do you have problems with reading?

N: No, not really.

E: Do you sometimes miss words on one side of the page when you are reading?

N: No, I've never noticed that.

E: Have you noticed that your vision is not so good on one side, for example on the left?

N: My left eye is fine.

E: Do you sometimes bump into things on one side or overlook people on one side more often than you used to?

N: Well, sometimes I bump into things, true. But that is only because there's such a lot of people out and about – and people are so inconsiderate.

E: What's your sense of direction like when you go out?

N: I find everything that I want to find. ³⁶

There are a few things of interest going on in this second exchange, but for now, just notice that not only has something gone missing, but – its *lack* has also gone missing! The patient seems oblivious of his deficit. There is a pretty big 'unknown unknown' here.

Although patients with neglect are usually unaware of their problem, some do have partial insight. But this very insight, when it exists, also reveals an interesting sense in which a neglect patient differs from one with a visual impairment. Here is another patient with neglect, as reported by Peter Halligan & John Marshall:

I knew the word 'neglect' was a sort of medical term for whatever was wrong, but the word bothered me, because you only neglect something that is actually there, don't you? If it is not there, how can you neglect it? It does not seem right to me that the word 'neglect' should be used to describe it. I think they thought I was definitely, deliberately not looking to the left. I wasn't really ... If it is not there, you are not neglecting it. ³⁷

Just let that sink in for a second. What this patient is insisting on is extraordinary. At least for the left hemisphere, attention constitutes the world in a very literal sense: as far as your left hemisphere is concerned, what it no longer attends to is not just unseen, but *ceases to exist*. The left hemisphere, it seems, is a Berkeleyan idealist.

And indeed, as a general rule, when the right hemisphere sees a partially hidden figure, it can see the implied whole³⁸ – for it, the hidden part exists; meanwhile the left hemisphere sees only the fragment: for it, the hidden part just does not exist, and the implied whole disappears. The deceptively

simple image below says much about the problems encountered when seeing the world from the left hemisphere's perspective.

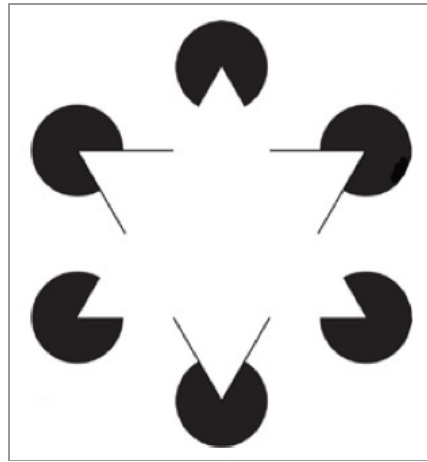


Fig. 5. Loss of the implicit in right hemisphere dysfunction. A triangle, resting on another, supported by six circles: in right hemisphere damage, the implied may become invisible, and the triangles are lost; there are only partial circles, half of which have protruding straight lines, like pincers, and half of which do not

Why does Mike not turn his own plate round, and eat what he must surely know he has left? Doesn't he remember that he encountered this problem yesterday, and the day before? He is, as I say, an intelligent guy. But for him the left side of his plate has ceased to exist. It isn't there now, and wasn't yesterday; it is not there – and *never* was there. There is a disorder of time as well as space.

ATTENTION AND DISORDERS OF TIME

In an important early paper, published in 1913, the Austrian neurologist Hermann Zingerle describes a 45 year-old clerk who had a stroke in the right temporoparietal region, resulting in neglect of the left side of space and of his body. 'His mood was often irritable, impatient, but generally cheerful, and he tended to be facetious', Zingerle begins, describing the mixture of jaunty insouciance and irritability typical of those with right hemisphere impairment. 'This was consistent', he continues, 'with the remarkable fact'

that he never mentioned his paralysis, disregarded it completely, and did not express any awkwardness about his handicap. He paid no attention to the left half of his body, seemed dismissive of it, and seemed to have completely forgotten about it. Even when his attention was drawn to his left side, he looked momentarily at, for example, his arm, and then took no further notice of it, and immediately began talking about something else. At the same time, he was quite aware that every person has a left and right side; he just didn't apply this to himself ... if one started to talk about the left side of his body, or asked questions concerning it, he suddenly went blank, and appeared obviously perplexed. He got embarrassed, made excuses, and became mute and inattentive; and it was impossible to evoke former memories of his left side. It was the same if the physician demonstrated the left side on his own body. The patient could recognise it: but this knowledge was irrelevant when applied to himself, and it did nothing whatever to prompt insight. If one persisted in trying to make clear to him the mismatch between his bizarre perceptions and the reality, by reasoning with him, or directing his gaze, he became more and more agitated, and there was no way he would come to an understanding. He was unaware of the oddity and absurdity of having only a right half ...

What Zingerle is pointing to is a failure of imagination (not fantasy, but imagination), the creative power that enables us to enter into what is there.

His patient can *no longer imagine – summon up – what it must be like to be different*. Despite ‘being able to perceive it with his senses’, he has lost, not just knowledge of the body now, but of it *at any time*, past, present or future:

not only has the patient lost the perception of the left half of his body, and knows nothing of his paralysis, he has also ... *forfeited the memory of the left half of his body*; both the perception and the previous knowledge of his left side were lost to him ... in his mind the representation of his body is apparently reduced to the right half, without any memory that this was once different.³⁹

Another patient of Zingerle’s

behaved in such a way as to make the greatest impression on all those present at the examination ... While he was able, despite his illness, to follow a conversation with concentrated attention ... *a sudden change came over him when he was asked to do anything involving the left part of his body*, or even if it were mentioned. Quite suddenly the patient would become completely unresponsive. He would gaze straight ahead without any sign of active attention, and showed no reaction, as if he could not hear, or understand what was required ... If he was asked to do something with his right side, he would always do so promptly ... In other respects swift to respond about his sensations, he could not be brought to say anything about his left side or to give an idea of his sensations on that side. Even insistent questioning, reinforced by shaking, resulted in a complete refusal by the patient. One could not get anything out of the same man who had moments before been talkative and attentive ... Whereas in relation to his right side he behaved completely normally, making appropriate use of it, reacting appropriately to all stimuli, and to questions about it, the left half of his body seemed not to exist for him ...⁴⁰

If, as far as the left hemisphere is concerned, the world exists only when that hemisphere pays attention to it, we have a problem, because its

attention is inadequate to sustain a coherent world, whether in space or time.

Let me make an analogy which (like all analogies) is certainly not an equation, but which will come, I believe, to seem more suggestive as Part I unfolds. The computer programmer knows far more than is in the computer, and is aware of that fact. The computer ‘knows’ only what the programmer puts into it. All else, as far as the computer is concerned, does not exist.

Unlike subjects affected by hemianopia, writes neuropsychologist Edoardo Bisiach,

neglect patients not only do not see stimuli presented in the contralateral half of space, but behave as if that half of space did not exist and never had existed. Indeed, the most astonishing aspect of neglect is perhaps this: patients suffering from it, not only are unable to perceive the left side of space, but are not even able to conceive it.⁴¹

The persistence of the world is guaranteed, it seems, only by the right hemisphere, rather as the persistence of unperceived elements of reality was guaranteed, in Bishop Berkeley’s philosophy, by their being present to the mind of God.

In illustration of Bisiach’s point, he and a colleague, Claudio Luzzatti, asked two patients with hemineglect to picture in their imagination a scene that was familiar to them – the main square in Milan, the Piazza del Duomo – as if they were looking toward the west front of the Cathedral, and to describe all that they could see.⁴² In this imaginary scene each patient was able to describe accurately the buildings that lay to the right along the south side of the square, but named in one case nothing, and in the other case almost nothing, that lay on the left. Later they were asked to imagine they were at the other end of the square, standing with the Cathedral behind them, facing the other way, and describe the scene in front of them. The patients now named the very places they had previously neglected but omitted those that had been previously recalled; only the buildings that lay along the north side of the square were now brought to mind. Even more astonishing, since neither had anything wrong with their memory, is the fact that they were not apparently dismayed by this in the least.

This finding is remarkable in a number of ways that have not always been appreciated. To begin with, it illustrates that attention is involved primarily not with seeing in itself, but – as far as the left hemisphere is concerned – with the bringing into being of the world, *seen or unseen*. We can see without attending and we can attend in the absence of sight.

Moreover, is it not strange that their recent experience just *disappeared*? These subjects are articulate people, in full possession of their faculties, as we would normally think of them, and they are not conventionally amnesic. How, then, can they not be aware of what it is they described only a short while ago? They can recall half the scene at one moment and the other half at another. Why can they not put the two halves together? It's like – why can't Mike turn his plate?

Various lines of thought converge suggestively. Some are already familiar to us: the right hemisphere integrates, while the left hemisphere fragments. Holding things together in space and time is how we bring a coherent world into awareness. What better demonstration can there be that, once the right hemisphere is compromised, the left hemisphere is incapable of putting the two parts of the scene together and seeing the whole?

But there are two further points worth making, while we are on the topic of time.

First, the fact of something coming and going from our awareness *necessitates* that it comes and goes from our awareness not just in space, but in time. If it is part of the living, embodied world, it is subject to time: outside of time it can have no embodied existence, and is purely an abstraction. An abstraction is neither permanent nor transitory. Whatever permanence, or transitoriness, a thing may have requires the presence of time (permanence is just when transitoriness lasts longer). Thus psychologist Cristina Becchio and philosopher Cesare Bertone posit that the key to the understanding of neglect is that it is a distortion of both space *and* time. As they put it, rather colourfully, this 'temporal distortion results ... in an ontological landslide, sweeping away the left side of the world'.⁴³

Second, it so happens that the right hemisphere is the source of our sense of time, as something lived through, as having duration (what Bergson called *durée*, in contrast with *temps*).⁴⁴ This is precisely what we would expect if the right hemisphere deals with the sustained continuity of real experience – where everything that happens, happens in the flow of time – and the left hemisphere with a comparatively abstract realm,

snapshots taken out of the flow, beyond the real-world context of actual, specific, existing beings that are subject to change.

What do we know of the role of the right hemisphere in understanding time? The right hemisphere is generally superior at estimating time intervals.⁴⁵ The integrity of the right hemisphere is critical for temporal reproduction of intervals longer than a couple of seconds.⁴⁶ And, while damage to the right hemisphere impairs estimation of time duration, it does so particularly drastically in patients with neglect.⁴⁷ This is consonant with the interesting finding that normal subjects show increased sensitivity to the duration of events that are presented in left visual space, the right parietal cortex being dominant for temporal integration.⁴⁸ Right frontal damage also impairs estimates of duration,⁴⁹ and indeed a network involving both prefrontal and inferior parietal areas in the right hemisphere seems to be responsible. In a study directly comparing those with right and left hemisphere damage, of those with time disturbance, 100% had right hemisphere damage involving those areas; subjects with lesions in the corresponding areas on the left showed no deficits of time appreciation whatever.⁵⁰ Neuroimaging in normal subjects demonstrates increased activity in right hemisphere frontal and temporal regions when individuals attend to the passage of time.⁵¹

Stephen Wolkind, Alwyn Lishman and I reported the case of a 23 year-old woman with Tourette's syndrome with severe impairment of every aspect of time appreciation, including complete inability to assess time duration, assess an appropriate time for her baby's feed (despite being a very concerned mother), or keep to time for appointments.⁵² She was fully disorientated in time. Despite normal full-scale IQ, she seemed cognitively out of tune with time: she thought that there were 10 seconds in a minute and 24 minutes in an hour, and could not rehearse the sequence of the months correctly. She had a complete inability to read a clock face, and, in drawing, filled in the figures on a clock face backwards. She was unable to distinguish between periods of weeks, months and years, and had a distorted chronology of her own life: in giving dates from her personal history she was either incorrect, sometimes by as much as five years (remember she was only 23, so five years is a long time), or used vague phrases such as 'a lifetime ago'. We termed such an extreme and global inability to appreciate time *dyschronia*. Patients with Tourette's show

evidence of right hemisphere deficits (this patient showed evidence of mild volume loss in the right hemisphere).⁵³

So important is the right hemisphere for time perception that not only does the capacity to assess the passage of time worsen after right temporal lobe excisions, but it may actually improve after left temporal lobe excisions.⁵⁴ Damage to the right hemisphere is responsible for almost all abnormalities of time perception. There is something called the *Zeitraffer* phenomenon, in which events appear to change speed, and often lose their fluidity of motion (the German name refers to time-lapse photography). The phenomenon was investigated by John Cutting, who remarks on the aptness of the term since subjects ‘may also experience movement as jerky and discontinuous’.⁵⁵ He could find 13 cases in the neuropsychological literature, all of which had right hemisphere damage, none left hemisphere damage.⁵⁶ Fred Ovsiew reported a further case with right temporal damage, and his literature review found the right hemisphere preponderance to be ‘striking’.⁵⁷

There is a slightly different condition, palinopsia (from Greek, *palin*, + *opsia*, ‘seeing again’), also sometimes called akinetopsia (*a*, + *kinet*-, + *opsia*, ‘seeing no motion’). In this condition movement can appear dislocated as if in a juddering ciné film and there is persistence of after-images (see Plate 3[b]). It has been described, according to an extensive survey, ‘much more frequently with right-sided than left-sided lesions’ (typically in the parietal or parieto-occipital region).⁵⁸ In his monograph on palinopsia (which he originally termed ‘paliopsia’), Macdonald Critchley described a case he considered typical, of a man with a gunshot injury to the right occipital region.⁵⁹ The subject found that when he focussed upon anything he felt his gaze pulled towards the right and a stream of static images replaced the flow of movement: ‘the various images were arranged in parallel series, close to one another, and they were all of the same size’, like an old reel of film getting stuck.⁶⁰

The overlap between the *Zeitraffer* phenomenon and akinetopsia is considerable: akinetopsia, too, is almost always consequent on right hemisphere (or bilateral) damage.⁶¹ In a series of 12 patients the disturbance could be localised to the right hemisphere in 10, or possibly 11, cases, and in only one to the left;⁶² another reported that 12 out of 14 palinoptic patients had right-sided lesions;⁶³ in two series of 3, all 6 cases

were right-sided.⁶⁴ Another survey by David Gersztenkorn & Andrew Lee, which claims to cover every case reported in the literature, revealed 45 that followed identifiable localised brain pathology: of these all but nine had right-sided lesions.⁶⁵ (Unfortunately the authors do not report handedness. They also appear to have overlooked the cases reported by Kömpf and colleagues in 1983, both involving right occipital lesions; the case reported by Arai and colleagues in 2002 which involved a right falcomeningeal meningioma; and two of the three cases (cases 7 & 9) of palinopsia reported by Landis and colleagues, in which the lesions were right temporo-occipital and right parieto-occipital).⁶⁶ In Macdonald Critchley's monograph on the condition (also overlooked by Gersztenkorn & Lee), of the five cases where localised brain pathology was verified, only one did not involve the right hemisphere. In one case report, a woman described seeing the smooth movements of people

as a series of discontinuous 'freeze frames'. The opening of a train door was 'broken up' and those nearby appeared to 'move in slow motion'.

There were recent infarcts in the right inferior parietal lobe and parietal-occipital junction; none was detected in her left hemisphere.⁶⁷ John Cutting reports a patient with right hemisphere damage who experienced time as 'a sequence of snapshots'.⁶⁸ I have reported other evidence elsewhere, and will discuss a particularly significant case of 'freeze frame' or 'stop-go animation' in a later chapter.

Right hemisphere damage leads, then, to impairment in the perception of temporal flow. And, importantly, the right hemisphere has a longer working memory, so that it is better able to *maintain* in awareness what is attended to over time. Take that away and our experienced reality may fragment.

It is from motion that we gain our sense of both space and time. The right hemisphere seems to be essential for both, and the capacity for each is linked with the other.⁶⁹ The left hemisphere's focus, however, narrows both. If I want to focus precisely on a particular element in my environment, clearly and in sharp detail, I have not just to home in on it in space, but to immobilise or freeze it in time, too. It becomes like a snapshot (what the

French call, suggestively, a *cliché*). The more precise anything is, the less content it has: ‘the more certain our knowledge the less we know.’ The left hemisphere’s experience is fragmentary and therefore taken out of the flow of experiential life, and tends towards stasis. It is concerned with the moment of the ‘kill’. However, outside of this glare of the spotlight, things carry on living, moving and changing.

While the right hemisphere gives the sense of duration, the left hemisphere is able to tell which of two sounds came first: whether it can do so better than the right hemisphere is uncertain, and the evidence is inconclusive.⁷⁰ At any rate, its processing concerns the comparative positioning of points (whether in space or time), rather than the continuous extent or *depth* of the medium; it cannot deal with the extended, continuous flow of time. Similarly, the left hemisphere can tell that a *point* in space is above or below, to the left or right of, another one, but as to actually where in the continuous field of space it is – how far away it is, how high above the other point it might be, and especially anything that implies the capacity to see depth – that depends almost entirely on the right hemisphere.⁷¹

Neuroscientist Jake Jordan notes the ‘striking lateralisation’ of function in the hippocampus in rats. His research suggests that ‘the left hemisphere stores spatial information as discrete, salient locations and that the right hemisphere represents space continuously, contributing to route computation and flexible spatial navigation’. This is a crucial insight into the way in which the right and left hemispheres differ in their understanding of time, space and motion.⁷²

ATTENTION AND DISORDERS OF SPACE

We have considered the phenomenon of spatial neglect. But are there other changes to the nature of space – as distinct from perceptual distortions, which form the subject of the next chapter – that characterise damage to one hemisphere?

The right hemisphere tends to present the world in three dimensions, with volume and depth as we experience it. In the left hemisphere's version of the world, however, both space and time seem to lack depth.⁷³ Space becomes relatively flattened and schematic, time tends towards a point, or points. After commissurotomy, the right hand gets input only from the left hemisphere, and as a result it can no longer draw a cube in perspective. The hand that all its life has been drawing cubes is now suddenly incapable of doing so: it produces something that looks like a child's flattened cube, an attempt to show all the surfaces in one plane. The left hemisphere, in other words, draws the 'theory', or idea, of a cube, what we *know* (that the cube has six sides), not the actual cube we *perceive* by paying attention to it (which has at most three surfaces visible, and at most one of them rectangular). Meanwhile the left hand of the split-brain subject still has input from the right hemisphere and, even though not practised at doing so, continues to be able to draw a cube in perspective.⁷⁴ Below are examples of copying a simple figure with the left or right hand in a subject five months after commissurotomy.⁷⁵

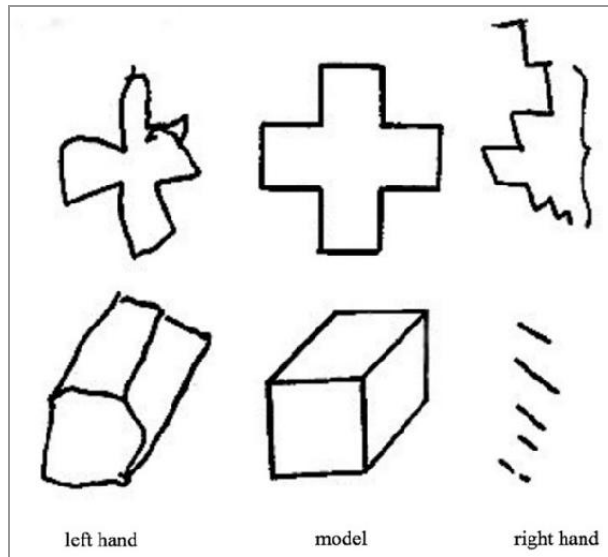


Fig. 6. Commissurotomy patient five months post-op, copying a model with either hand (from Bogen 1969: detail)

Disturbance of visual depth perception can also be observed in stroke patients. In 1935, Hans Hoff and Otto Pötzl reported two cases showing a foreshortening of visual depth: both were due to right-sided brain insults, one in the right intraparietal region and the other in the right occipital ('calcarine') region.⁷⁶ In experimental suppression of the right hemisphere, Nikolaenko found that in the left hemisphere objects are 'represented as if they were seen in the *distance*, in a *plane*, *bodiless* and *generalised*'; the left hemisphere tends to re-present the visual world as not just flattened, but as abstract and schematic.⁷⁷ Additionally objects become stylised, symbolic, 'geometricised': a tree becomes a stick, or a Y; a flower becomes a circle like a button with regular segmentations to denote petals; a person becomes a pair of rhomboids, one on top of the other, or a stick man.⁷⁸ Because of the relative difficulty involved for the left hemisphere in assessing depth, it may get the size of objects notably wrong.⁷⁹ The flow of life is lost. By contrast, the drawings of the isolated right hemisphere are recognisable three-dimensional, living, flowing forms, though they may lack detail.⁸⁰

A striking experiment by Ramachandran and colleagues demonstrates how an attentional defect – in this case, neglect – wholly alters the subject's very sense of reality:

Contrary to what the term ‘neglect’ implies, the syndrome must surely involve much more than simply ignoring the sensory input from the left side of the world. To explore this experimentally, [we] recently asked a patient to turn her head to look into a mirror hanging on her right – parallel to the sagittal plane. Standing on her left (neglect) side, I then showed her a candy-bar, the reflection of which was clearly visible to her. Remarkably, instead of reaching leftward to accept the candy, she repeatedly reached into the mirror – even though she knew it was a mirror – complaining all the time that the candy was beyond her reach. (Another patient even tried reaching behind the mirror!) Thus, even the patient’s ability to make rational deductions had become selectively distorted to accommodate the strange new sensory [or, as I would say, attentional (IMcG)] world that she now inhabits.⁸¹

The right hemisphere of normal subjects can be temporarily, experimentally, suppressed. Both depth and perspective, as if by a stroke of magic, are suddenly diminished or lacking altogether.⁸² Patients with right posterior stroke may experience a complete and disconcerting loss of depth perception resulting in ‘flat vision’, as if all existed on the plane of a screen at a certain distance away from the subject: an IT fantasy.⁸³ Patients with right, but not left, hemisphere damage cannot infer three-dimensional structure from motion.⁸⁴ All in all, it is the right hemisphere that underwrites our sense of the depth of space, time and –motion.⁸⁵

ATTENTION AND DISORDERS OF MOTION

Motion is flow in space and time.

Some exciting new research confirms how important it is to think in terms of a whole hemisphere, not just a module (or still worse not to investigate or report hemisphere differences at all). It concerns the topic of motion perception. The research demonstrated, first, which is interesting in itself, that patients with a right temporal visual lesion found it difficult to perceive central motion, regardless of form or speed, or to infer three-dimensional structure from movement, while those with an equivalent left-sided lesion were unaffected. So far, so familiar: without the right hemisphere's input, the left hemisphere's central field becomes motionless, much as expected. But hitherto motion perception had been thought to rely on a specialisation in the parietal cortex only. 'This dramatic finding', according to the authors,

*indicates that motion-sensitive areas of cortex by themselves do not suffice for normal motion perception and that additional cortical regions are required ...*⁸⁶

This might not sound that significant. But the import of this is that to assess and to *understand* motion, even of the most simple kind, involves other aspects of perception, and depends not on just one or two local 'components', but on the concerted action of broad areas of integrated right hemisphere cortex, including, in this case temporal, cortex. What that means is that motion is not just another accidental characteristic, like being blue or round, but is foundational in some deeper way. (I will argue that, along with time, with which it is intimately related, it is, in fact, foundational to being: see Chapter 23.) The lesson is that thinking in terms of large integrated networks within a hemisphere may reveal what focus on narrow regions of interest (ROIs) cannot.

While it is generally accepted that the right hemisphere is responsible for our sense of time, and that damage to it causes alteration of the speed of perceived motion, *both* acceleration and deceleration have been reported. Clearly both do occur, and the situation is usually left at that. But can we be

more precise about what is happening? It might reveal something of interest.

In the first place, if your sense of time slows way down, will not the motion going on around you (that you are not focussing on, or part of) appear unreasonably speeded up? And, in the second, if the stabilising, integrative effect of the right hemisphere across the world of experience is lost, won't the attentional field separate out into two relatively distinct realms, one at the focus, where the left hemisphere dominates (no longer moderated by the global concern of the right), and where everything is *slowed down*; and one at the periphery, where in as much as things are perceived at all, they are indistinct and, by comparison, seem *speeded up*?

Some of the evidence certainly suggests that this is precisely what happens. Here is a report of a man who suffered a right hemisphere stroke, in which both stasis at the focus, and speed at the periphery, are exaggerated. A 62 year-old man in a Viennese café experienced a 'strong attack of vertigo':

as he attempted to cross the street, he thought that cars were rushing towards him from the right and left. When he looked back towards the cars, he noticed they were not moving so quickly; on the contrary, it seemed as though the car he had just fixed his eyes on was now moving very slowly. He took two steps back from the curb and noticed pedestrians moving quickly toward or away from him. He called out to one pedestrian who approached him and he had the impression that he was slow to come to his aid ... in a taxi he noticed that everything within range of his vision was occurring in accelerated motion. It did not occur to him [then] that in the centre of his visual field he was seeing things in slow motion ... On another occasion, the nurse and doctor who were summoned moved so quickly that the patient became 'dizzy'. When he then looked directly at these quickly moving figures, which he did only with difficulty, the figures seemed to remain still ... He noticed that an intense noise – like the crackling of a motorcycle – forced an acceleration in the periphery and a central deceleration. When he looked out the window, pedestrians in the outermost field of vision seemed to be moving at a speed of about 40 kilometres per hour ...

objects that were fixated, eg people, were moving along ‘as in a funeral procession’.⁸⁷

This case was reported by the early twentieth-century neurologists Hoff & Pötzl, who refer to two cases with similar combinations of deceleration at the centre and acceleration in the periphery of the attentional field.⁸⁸ Since this is an attentional problem, not a problem with the visual system, it could occur in any sensory modality; in the case above this seems to happen both visually and aurally – with the sound of a motorbike, for example. As if to make the point, another patient, also with a right hemisphere stroke, displayed the same phenomenon in sound. When people spoke to him directly it was always at normal speed and quite clear, but when they talked among themselves he wondered ‘why they were trying to set a record for speed-talking, and how they managed to do it’.⁸⁹

Here is a more recent description, in the most striking terms, of the experience of a right temporal stroke:

I vividly remember looking up at the showerhead and having the perception that time had slowed. The water stream from the showerhead separated into droplets as they moved away from the head (that was normal and real) and I recall seeing the drops seemingly hang in mid-air but I don’t recall them stopping. The effect was very similar to the way the bullets travelled in the Matrix movies, minus the trails that the special effects crew added behind the bullet. I don’t recall any trails behind the water droplets, though that may be a failure of my memory. I remember the scene being very clear. I noted to myself at the time that I could see every droplet clearly when you’d normally perceive the streams as more of a blur of movement. I can’t remember if I saw them speed back up afterward, though I have a vague notion that they did while I was looking ... As I think about it, it seems a good way to describe it is that the water droplets went into sharp focus as they slowed down, but I’m unclear how the event resolved itself.⁹⁰

This beautifully describes left hemisphere vision: at the centre of the field, the world is extraordinarily precise and almost motionless, and,

although he cannot be sure in reporting this, his impression is that in the periphery it regains speed and indistinctness. Flow is suspended.⁹¹

This makes a fascinating contrast with neuroanatomist Jill Bolte Taylor's experience of a *left* hemisphere stroke while having a shower (thus releasing, instead, the right hemisphere's take on the world). She describes how she 'reeled backward in response to the augmented roar of the water'.⁹² In the right hemisphere, then, flow is, by comparison with the normal situation, enhanced.

Another early Austrian paper, by a colleague of Pötzl's, Ernst Pichler, reports four cases of right hemisphere damage, three with alterations of time perception. One subject with right parietal damage reported seeing people move 'as if in a slow-motion sequence from a sports film'.⁹³ Another, with more diffuse right hemisphere damage, complained that 'the people who went up and down in the room – mainly nurses – moved abnormally quickly, so that he could scarcely follow them with his eyes ... [at the same time] he had the feeling that time stretched out endlessly.'⁹⁴

Another patient – this time from the classic series of the pioneering neurosurgeons Sean Mullan and Wilder Penfield – with a right hemisphere glioma, a brain tumour, had the illusion that if she was looking directly at moving things or persons, they slowed down, and

were extremely well defined and conspicuous, and almost [de]composed into their different parts. She compared the illusion to 'a movie going slow motion' ... If she was looking at an immobile object, it appeared as though it were 'still more fixed.' Her surroundings seemed to be at 'double standstill'.⁹⁵

Notice the decomposition into parts, and being 'well defined and conspicuous', two further indicators that this is left hemisphere attention. A different patient from the same series, with a right temporal glioma, had similar experiences:

visual illusions of slow movement, increased fixity of the immobile objects and increase in visual detail (e.g., in one attack, looking at her hands, she observed that the skin pattern was extremely well defined).

Once again the very clear visual detail at the focus of attention, combined with the illusion of fixity, suggests that the deficit due to the right hemisphere tumour has given rise to an exaggeration of left hemisphere attention.

The study on motion perception earlier reported is relevant here: patients with a right-sided, but not with a left-sided, lesion in the ventral visual pathway displayed widespread impairments in central motion perception.⁹⁶ This is in keeping with an earlier study reporting that only right-sided lesions caused difficulties in processing visual motion.⁹⁷ An unusual case of a patient who was actually *motion-blind*, reported by Josef Zihl in 1983, had bilateral lesions, though on re-examination by Zihl and others in 1989 it was reported that the principal lesion was right-sided.⁹⁸

Right parieto-occipital lesions, then, cause deficits of visual depth perception, time perception and motion interpretation.⁹⁹ An epileptic focus can sometimes lead to an exaggeration of the normal activity of the affected cortical area. A patient with a left hemisphere epileptogenic focus found that everything in the visual field to the right, the left hemisphere's priority, seemed to grind to a halt: 'the patient reported that there was no motion of objects seen within the [right] visual hemifield affected'. After surgery, objects were no longer stationary, but they continued to slow down as they moved into the right visual field.¹⁰⁰

Disturbances of motion are rare after left, as opposed to right, hemisphere brain damage, but when they do occur, they are the reverse of what has just been described: the *centre* of the field of vision now seems not slowed down, but speeded up, since the Gorgon is no longer operative. A patient with a left frontal lesion reported that 'external objects seemed to be rushing toward him at an incredible rate ... He complained that he could no longer tolerate watching television, because the progression of events was too quick for him to follow'.¹⁰¹ It is like Jill Bolte Taylor's 'augmented roar' after her left hemisphere stroke.

In passing I should mention that the idea of a fixed stare (of the Gorgon, or of the basilisk, for example) that immobilises and kills is embedded in the mythology of, certainly, Western cultures going back to the Minoan civilisation. It is also relevant (a topic that I have explored elsewhere) that when we find ourselves to be objects of attention, we respond to the quality of attention to which we are subjected, and experience ourselves as transformed by it: when we are stared at, we feel ourselves *immobilised*,

which is perhaps why prey seem – and indeed are – transfixed, as we put it, by their predators.^{[102](#)}

It seems then that the left hemisphere world lacks some pretty important aspects of reality – those to do with time, space and motion. How real, in other respects, is the world generated by the left hemisphere?

ATTENTION AND DISORDERS OF EMOTION

Let's go back to Zingerle's patients a moment. The attitude of these right hemisphere stroke patients to what has happened is frankly bizarre. As far as they are concerned, their left half has just gone missing: they are likely to be partially or wholly, paralysed on one side. Yet their attitude seems inappropriately lacking in affect, in *depth* – not depth, here, in space or time, but *emotional* depth. Take another example, that of a patient who, following a right hemisphere stroke, developed an 'extra' hand and part of an arm, and who seemed generally somewhat depressed:

However, when speaking of the 'extra' hand she would become gay and bantering. If she were unable to 'find' it she might remark: 'Oh, it will turn up after a while, just when you don't want it.' When asked if the arm had changed at all she replied, 'No, just as heavy; it's a nuisance – why don't you take it home with you? I'd like to know what your wife would say. You'd really have to make up a story!^{[103](#)}

Such patients are either irritable, inappropriately jocular, or totally unresponsive. Remember the muteness that Zingerle's patient displayed. It is known for patients, whose speech is otherwise normal and not in any way affected by the stroke, to become mute, or for them even to utter pure gibberish – but only so long as their attention is drawn to the left side. Otherwise it is normal.^{[104](#)}

Although the muteness has a defensive feel, it goes well beyond a reluctance to deal with a painful topic. Sometimes neglect has, indeed, been framed as a form of denial, in the Freudian sense of the repression of unwanted knowledge about a handicap. But patients with a left hemisphere stroke, whose right hemisphere is therefore intact, complain, understandably and sometimes bitterly, of their handicap, often having severe emotional reactions. Those with right hemisphere strokes as a rule do not. And indeed the second patient of Zingerle's ('Case III') that we referred to did not even have a paralysis: so his odd detachment cannot be

accounted for on the basis of shame about, or fear of, losing the use of a limb.

As I hinted, in the report of Bisiach and Luzzatti one of the two subjects did mention a couple of prominent items from the neglected side in one of the trials. But as so often it is not just *what* was done, but *how* it was done, that matters. The authors noted a curiosity: ‘while central and right-sided items were enumerated in a rather lively manner and sometimes dwelt upon, the few left-sided items were mentioned in a kind of *absent-minded, almost annoyed* tone’.¹⁰⁵ As if dismissive.

Then, remember the patient of Kerkhoff’s? As he says, neglect patients have a tendency to give answers that are ‘vague, inappropriate and beside the point’:¹⁰⁶

E: Have you noticed any changes in your vision ... ?

N: No, none that I know of. Except there’s something not quite right *with my glasses* ...

E: Have you noticed that your vision is not so good on one side, for example on the left?

N: *My left eye* is fine ...

N: Well, sometimes I bump into things, true. But that is only because there’s *such a lot of people* out and about – and people are so *inconsiderate*.

At first all is fine: the patient has no problem (nothing wrong with his eyesight, just with the glasses). Then there is what looks like a deliberate evasion: when asked about his vision on the left, he replies that his *left eye* is fine – which has the virtue of being true, but is beside the point, because his left-sided vision is patently not. And then notice that, to the extent that a problem *is*, to any degree, admitted, it is clearly someone else’s fault. There are too many people and *they* bump into *him* because ‘they are so inconsiderate’. And his last answer, ‘I find everything I want to find’, seems

defensive, as though he knows there is something wrong, but can't admit it, even to himself.

These patients exhibit not just neglect, but what is called anosognosia (Greek *a*, not, + *nosos*, disease, + *gnosis*, knowledge), unwillingness to acknowledge a deficit, as we have noted. This is almost always consequent on right hemisphere damage.¹⁰⁷ This might sound like a simple cognitive problem, a neglect of information, rather than, as it is, a denial of experience. There is not just a derangement of cognition (knowledge about), but of affect (emotional involvement with), known as anosodiaphoria (Greek *adiaphoria*, indifference).¹⁰⁸ Of a patient who had just had the right hemisphere of his brain removed, his clinicians noted, 'we were surprised to find a man who could discuss his condition in a seemingly detached and objective way. Our surprise was shared by most other people who met the patient.'¹⁰⁹ Another referred to his paralysis in 'an almost facetious manner', and 'throughout the consultation, he cheerily and light-heartedly bandied small talk with his doctors'.¹¹⁰ A 40 year-old woman with a right parietal tumour reported that she was 'half a woman' and that her left side was dying away. At the same time she was euphoric, displaying a complete lack of concern, and what is described as a '*j'm'enfichisme total*': she absolutely couldn't care less.¹¹¹

Including about the truth: there is a strong tendency to disown problems, fail to take responsibility, and to maintain to the last that it is 'nothing to do with me, guv'. The right hemisphere-damaged, left hemisphere-reliant, patient is always in the right.

A colleague told me the story of one of his neglect patients, who had hit his car on the left side no less than six times while driving it into the garage. 'My garage was designed by a friend who is an architect', he said. 'Some "friend"! He has come back and changed the size of the garage entrance without telling me. Now I see who is my "friend". And to think – for so many years he was just pretending to be kind to me'.¹¹²

This disowning has its roots in a disconnect between the perceived outcome and the conscious will. The left hemisphere's is the wilful consciousness, the one that makes things happen. Its purpose is clear: action towards a target that is centre-stage, taking possession of what is in full vision. But unfortunately it knows remarkably little about all the rest. So when things outside its ken happen, they logically *must* have been willed by someone else. They are someone else's responsibility. This is why

schizophrenia, a condition which mimics right hemisphere damage in many respects, is characterised by what are known as ‘passivity phenomena’: the sense that thoughts, actions, feelings and even moods, that come from the unconscious mind, or at least from the periphery of consciousness, are caused by someone else. They have not been integrated into the self: for that to happen a properly functioning right hemisphere would be required. They become instead a trigger for paranoia: who are these mysterious malefactors?

As if to confirm this, the reverse happens in depression. Whereas in schizophrenia the right frontal lobe is underactive, and responsibility for one’s own thoughts, actions and mood is not accepted but projected outwards onto others, in depression the right frontal lobe tends to be relatively overactive compared with the left; subjects are *over*-willing to accept responsibility, even taking responsibility for things they could have nothing to do with. A patient of mine, a middle-aged doctor, believed he had caused the war in Bosnia; and depressed individuals have even been known to present themselves to the police, demanding to be arrested for the terrible crimes which (they say) they have committed. The right hemisphere is the most important mediator of our empathic, other-connected, responsible – more selfless – self. The German psychopathologist Werner Scheid spoke of the ‘pointer of guilt’ [*der Zeiger der Schuld*], that points in the centripetal direction in depression, whereas a paranoid psychosis must be assumed when it starts pointing in a centrifugal direction towards others.^{[113](#)}

How far can disowning be taken? Well, let’s have a look. The first of Zingerle’s patients insisted that

on his left there was someone lying in the bed – a woman – at which he pointed to his left side, and could not be dissuaded of this even when he inspected the area ...

He complained about her spoiling his sleep. So his arm belonged to a woman who happened to be in his bed, and disturbed his nights – and that was that. He said all this in a wholly inappropriate, jokey fashion, meanwhile erotically caressing his left arm.^{[114](#)} That’s disowning good and proper: ‘Not a little-place-at-Tooting, but a country-house-with-shooting

and a ring-fence-deer-park Lie!’ Except it isn’t strictly a lie, as I shall explain. He exhibits a further, decidedly odd, phenomenon called somatoparaphrenia (Greek, *somat* -, body, + *paraphrenia*, madness) – a conviction that part of one’s body belongs to someone else. Such cases are far from unusual in right hemisphere damage.^{[115](#)}

ATTENTION AND CONFABULATION

If you don't know how to explain something, why not just make it all up? Welcome to another important feature of the left hemisphere's world: confabulation.

Confabulation means the invention of a story to fill in a gap. It is not the same as lying. In lying we are conscious of the deceit; in confabulation the subject believes the story. I can't remember where I was yesterday, so, instead of saying I don't know, I make something up: 'I was working in a jeweller's shop', as one of my patients confidently informed me (in reality, he had been on the ward all day; he had worked as a postman in Cardiff, and his wife confirmed he had never worked in a jeweller's shop in his life). There is no shame involved and no sense of whether the story is plausible:

Pressed to justify their judgments, the patients were often illogical and oblivious to self-contradiction ... Patients who were inconsistent usually offered an irrelevant comment or said nothing when the examiner pointed out the inconsistency. *No patient ever showed embarrassment.*¹¹⁶

So confabulation has two characteristics that make a thought-provoking pair: when it is the consequence of right hemisphere dysfunction, the confabulated story is often implausible, but is held with total conviction, not in a tentative, 'oh well, I suppose I must have' sort of way. And, while confabulation can happen in a range of conditions, including sometimes after left hemisphere damage, it is much commoner after right hemisphere damage, when it is also more florid, and more incorrigible.¹¹⁷ In fact it is a bit of a left hemisphere specialty.¹¹⁸

The neuropsychologist Michael Gazzaniga calls the left hemisphere 'the interpreter', because, he says, it makes up the stories that fill in the gaps. The trouble is that when it hasn't got a right hemisphere to help it out, its assessment of what is realistic is not what it should be. In a recent book, he writes:

Though the left hemisphere had no clue, it would not be satisfied to state it did not know. It would guess, prevaricate, rationalize, and look for a cause and effect, but it would always come up with an answer that fit the circumstances. In my opinion, it is the most stunning result from split-brain research ... The right hemisphere does not do this. It is totally truthful ... [119](#)

On this, a brief diversion. A famous example, reported by Gazzaniga and his colleague Joseph LeDoux, illustrates the point. It is important to understand that this involves a split-brain patient.

The experimenters show him a picture projected to one or other hemisphere on its own and ask him to pick a card connected with the scene. For example, they show a snow scene to the right hemisphere and ask him to choose an appropriate picture from an array of cards, with either hand. He cannot *say* what it is that he has seen, because only the right hemisphere saw it, and the right hemisphere cannot speak; but his left hand, controlled by the right hemisphere, is able to go straight to the picture of a shovel. However, since the left hemisphere did not see anything at all, his right hand chooses at random, and scores no better than chance.

Then the experimenters make things a bit more interesting. At the same time that they flash a picture of the snow scene to the right hemisphere, they flash a picture of a chicken claw to the left hemisphere. Because the hemispheres are disconnected, each hemisphere has knowledge of only one image, and in each case it is different. When they ask him to choose an appropriate card, again his left hand chooses a shovel (because the right hemisphere has seen the snow), but the right hand chooses a picture of a chicken (because on this occasion the left hemisphere saw a chicken claw). When asked why his left hand had chosen the shovel, his verbal left hemisphere, which has to respond to the question, but knows nothing of the snow scene, the real reason for choosing the shovel, is not in the least abashed. He confabulates, explaining that he saw a chicken, ‘and of course chose the shovel because “you need that to clean out the chicken shed”’.

Not so much chicken shit, but another kind springs to mind...

The really interesting finding here, as the authors themselves put it, is that ‘without batting an eye’ the left hemisphere draws mistaken conclusions from the information available to it and lays down the law

about what only the right hemisphere can know: ‘yet, the left did not offer its suggestion in a guessing vein but rather [as] *a statement of fact*’.¹²⁰

A rather nice – now classic – piece of research may exhibit both the left hemisphere’s tendency to grasp and its tendency to confabulate. Asked to choose tights from an array of four on a line (all of them in reality identical), normal subjects preferred tights in the rightmost position by a factor of 4 to 1, then confabulated about the reasons. None mentioned the position as a factor.¹²¹

Back to our right hemisphere-damaged patients. An inability to acknowledge parts of the embodied self, known as *asomatognosia* (Greek *a*, not, + *somat*-, body, + *gnosis*, knowledge) has been estimated to occur in 90% of all right hemisphere strokes, and in 100 cases examined by Feinberg, who has made the most extensive investigations of the phenomenon to date, it never once followed a left hemisphere stroke, always a right hemisphere one.¹²² It can be temporarily reversed by caloric vestibular stimulation of the right hemisphere (ie, irrigating the left ear with ice water).¹²³ You might be forgiven for thinking that only someone with actual and extensive brain damage could possibly deny a part of their own body, but the phenomenon can be replicated *simply by selectively inhibiting your right hemisphere*. In an experiment with 62 normal subjects that had their right hemisphere suppressed, 60 displayed either *anosognosia* (failure to acknowledge a deficit), or *asomatognosia* (failure to acknowledge a body part).¹²⁴ That’s all it takes to end up believing, with conviction, some very odd things about the world indeed.

The border between *asomatognosia* and *somatoparaphrenia* is somewhat artificial. There is a good deal of phenomenological overlap in many cases, and they tend to be caused by similar right hemisphere lesions, especially in either the right posterior parietal and insular area or right premotor cortex.¹²⁵

A case, resulting from a right posterior parietal stroke, is described by Hécaen & de Ajuriaguerra:

‘Give me your hand’: gives her right hand. ‘Give me the other one?’: withdraws her right hand from the examiner’s and places it in his other hand. If one repeats the request, she transfers her right hand from one hand to the other, making no effort to offer her left

hand. When she is confronted with her left hand, and asked whose hand it is, she replies: 'it's your right hand'.¹²⁶

One subject, reported by Bisiach and his colleagues Maria Rusconi and Giuseppe Vallar, was absolutely convinced that her paralysed left arm was her mother's.¹²⁷ She could not by any means be dissuaded from this position, and was dismissive when asked to explain what it was doing in her bed. However, amazingly enough, when her damaged right hemisphere was temporarily stimulated (again by caloric vestibular stimulation), her delusion was banished: she freely acknowledged the arm was hers, and seemed puzzled as to why she was being asked whose arm it was. Once the right hemisphere stimulation wore off, however, she was again quite adamant that the arm was her mother's. These findings have since been replicated.¹²⁸ Other patients have claimed that the offending arm was made of plastic, or that it was a dead hand someone had put in their bed. A white woman thought hers belonged to a little black boy in bed with her. Another was convinced that the nurses had carelessly bundled up his arm with the dirty laundry and sent it away to be washed.¹²⁹ (Remember, when it comes to the left hemisphere, it's always someone else's fault.) Ramachandran reports the case of a woman whose entire left side was paralysed, and was admitted to hospital because, as the patient put it, 'my daughter felt there was something wrong with me'.¹³⁰ The following conversation between Ramachandran and the patient took place:

Q: Mrs M, can you use your arms?

A: Yes.

Q: Can you use both hands?

A: Yes, of course.

Q: Can you use your right hand?

A: Yes.

Q: Can you use your left hand?

A: Yes.

Q: Are both hands equally strong?

A: Yes, they are equally strong.

Q: Mrs M, point to my student with your right hand.

A: [Patient points.]

Q: Mrs M, point to my student with your left hand.

A: [Patient remains silent.]

Q: Mrs M, why are you not pointing?

A: Because I didn't want to.

The next day, she answered similarly, but then pointed to her own left hand and asked Ramachandran, 'Whose hand is this?'

Q: Whose hand do you think it is?

A: Well, it certainly isn't yours!

Q: Then whose is it?

A: It isn't mine either.

Q: Whose hand do you think it is?

A: It's my son's hand, Doctor.

Todd Feinberg reports a series of such patients.¹³¹ ‘I told my brother to remind me to take this thing home with me or I’ll leave it here’, one says. ‘It’s a piece of useless equipment.’ Other possibilities suggested by his patients include that their left arm was a remote control, a telephone pole, ‘a stock option’, a perfume bottle, mother-in-law’s hand, a breast or a deodorant. A second patient who thought the hand was her mother’s also believed it was her mother who was in hospital and who had had the stroke, not she herself. Another repeated several times the same story that it was ‘a hand that was left on the subway and they brought it here and they put it on me’. (It’s ‘them’ again.) Another’s arm was his brother’s, which had been chopped off by gangsters and placed in a coffin. Another patient’s was still in the garbage, with a plastic cover: ‘You’ll find [it] there ... but be careful, though – the nails are very long, and very sharp!’

That there is an affective component – a dislike of the affected limb and *all that is associated with it* – is essential to the phenomenon. After a right hemisphere stroke, a woman exhibited a total unawareness of her severe left arm paralysis and repeatedly affirmed that the paralysed hand belonged to someone else. But, more intriguingly, while she was able to see and describe the rings she had worn for years and was currently wearing on her left (now disowned) hand, she resolutely denied they were hers. By contrast, she immediately recognised these rings as her own (and produced much veridical autobiographical information about them) when they were shifted to her right hand, or displayed in front of her. Equally she was prompt in acknowledging personal belongings that, in her previous experience, had not been ordinarily associated with the left hand (for example, a keyholder or a comb), even when she saw such objects in contact with that left hand. Thus her denial was conditional not on the situation alone (on her left hand), but on the existence of an emotional association with the left hand.¹³²

It is important to bear in mind that these are people whose other conversation shows no sign of delusion. They are not what we used to call ‘mad’. Yet according to Feinberg, ‘confabulations and delusions were repeated on more than one occasion, were reported with great conviction and were relatively refractory to correction by the examiner’.¹³³

In fact people with somatoparaphrenia – or actually any right hemisphere deficit delusional state, including schizophrenia – will scarcely

ever budge from their delusion in the face of any kind of evidence.¹³⁴ Here is a woman with a paralysed left arm:

Examiner: What is this over here? Take a look over here [indicating patient's left hand]. What is this?

Patient: Your fingers.

E: Take a good look. What is it? [Taps the back of patient's hand.]

P: The back of your hand.

E: The back of *my* hand?

P: Yes.

E: Suppose I told you that this was *your* hand?

P: I wouldn't believe you.

E: You wouldn't believe me?

P: No, no.

E: This is *your* hand.

P: No.¹³⁵

Sometimes the affected part is under alien control: once again it is not 'my' problem, it's what someone or something else is doing. A patient described by François Lhermitte showed no concern about being paralysed down his left side and was positively euphoric: 'it seemed as if the entire left-hand side of his body had disappeared from his consciousness and from his psychic life'. Three days later, however, this patient reported that from time to time an alien hand, which disturbed and annoyed him, came and placed itself on his chest. 'This hand presses on my tummy and chokes me'. 'This hand bothers me', he said again, 'it doesn't belong to me, and I'm

afraid it might thump me.’ He thought it might belong to the man in the next bed. Notice the emotional repertoire, from euphoria to paranoia by way of annoyance. Another patient came to believe that the left side of his body was ‘evil’ and controlled by external agents, perhaps by the devil in collusion with his dead father.¹³⁶ If that sounds a little like schizophrenia, don’t dismiss the thought: schizophrenia shares a very large number of characteristics with right hemisphere brain damage.

Some of Feinberg’s patients also exhibit yet another intriguing phenomenon which follows damage to the right hemisphere.¹³⁷ It is called ‘reduplicative paramnesia’. This is where the subject becomes convinced that there is a copy, or more than one copy, of some important aspect of the world: the self, a spouse, the environment. Two of his patients, quite independently, expressed the same belief that there were three or four hospitals with the identical name. The most elaborate case I am aware of involved a man who reported eight ‘impostor’ cities, duplicating the patient’s own: he said he had spent the last eight years wandering between them, without finding the real one. There were also eight duplicates of his wife and children, each duplicate living in a separate duplicate city with a double of the patient.¹³⁸ More recently a Hungarian patient described between 20 and 30 clones of himself, which he called ‘twinnies’ (the Hungarian neologism *ikri* reduplicates the already reduplicative ‘twins’, *ikrek*), but these were somewhat vague in nature.¹³⁹ In the latest review of the literature 45 cases were identified, of which 23 had unilateral lesions.¹⁴⁰ Twenty-two of these were right-sided, and the one left-sided case was a left-hander.¹⁴¹ Other reports to date invariably implicate the right hemisphere.¹⁴²

What seems to have happened is that the experienced world has fragmented. Instead of there being one person or place, consistent and persistent over time, there are a whole lot of different ones that come and go from existence, like ‘freeze frames’ or snapshots. Reading and registering the *uniqueness* of faces, and of real-world complex scenes, another right hemisphere faculty, has been lost. And so a very odd confabulation has been created to make sense of a world in which there is neither uniqueness nor continuity. Every change means a new start with a fresh copy, not a different aspect of the same unique, enduring whole in time and space.

There is a closely related phenomenon called ‘delusional misidentification’, seen in psychiatric patients, that also commonly involves dysfunction of the right temporoparietal region (with or without involvement of the left hemisphere). John Cutting refers to an ‘overwhelming link with right hemisphere damage’.¹⁴³ Patients with this disorder may develop the belief that someone they know is duplicated in different places at different times, and may mistake strangers for someone familiar. A patient of mine accused her husband of two-timing because she believed she saw him on several occasions with different women while she was out in the town shopping, at times when she knew he should have been at work. This curious condition is called Fregoli syndrome, after an Italian quick-change artist of the early 1900s. And right hemisphere deficit syndromes can result in something which looks like the opposite, but is really a different manifestation of the same phenomenon: the belief that a person you know very well is actually being ‘impersonated’ by an impostor, a condition known, after its first describer, as Capgras syndrome.

Delusional misidentification is sometimes thought to be associated with something called prosopagnosia, the inability to recognise faces, which is also generally a right hemisphere deficit syndrome. But this cannot be the whole story, not only because it has been identified in blind subjects,¹⁴⁴ but because it can involve inanimate objects, as well as people. Another patient of mine, for example, began a vendetta against someone who, she believed, had entered her bedroom and subtly changed all her clothes for copies of a slightly inferior quality, something she could tell merely by touching them. Once again the uniqueness and persistence of a whole has fragmented. If something is experienced slightly differently on a different occasion, it must be a different entity – because things *do not change*. This is what makes Fregoli and Capgras syndromes, which look like the opposite of one another, actually the same in terms of ontology. If you had long hair and a smile when I left you in the morning, and you have short hair and a frown when I come back in the evening, I don’t normally assume you are being cleverly impersonated by someone else, or that you are a quick-change artist. I assume you are getting used to a bad haircut. As a way of joining up the dots, it is a tad more credible. But, once again, joining up the dots to see the whole is a quintessential function of the right hemisphere, not the left. Some such right hemisphere deficit, resulting in fragmentation of the sense

of self, may be involved in dissociative states and multiple personality syndromes.^{[145](#)}

ATTENTION AND DEVITALISATION

The story of devitalisation begins with cutting things up. This brings us again to the relation between the whole and the parts. The left hemisphere begins with parts, and any idea of the whole is built up from those parts. By contrast, the right hemisphere begins with the whole and any ‘parts’ are just aspects of the whole that have been artificially decontextualised. This follows directly from their different modes of attending.

Although you may imagine that you construct the world by putting together the bits that your gaze lands on, adding the pieces one by one and recognising that this must be – tada! – your living room, in fact it is the other way round: you take in the whole first, and then your gaze is attracted by particular parts. The exploration of complex scenes begins with a global take, characterised by short visual fixations and long-range saccades (brief, rapid eye movements), which within a few seconds proceeds to a focal mode of processing.¹⁴⁶ This correlates with a shift of activity from the right to the left hemisphere.¹⁴⁷ When you see a figure of the number 4 composed of lots of little circles, or an H composed of lots of little 2s (see Fig. 7), you normally see the 4 and the H first, and the details, the little circles and 2s, come only later. This phenomenon demonstrates what is known as the ‘hierarchy of attention’, which means that we see things whole with the right hemisphere first, before homing in on details with the sharply, but narrowly, focussed gaze of the left hemisphere. As one might expect, this hierarchy is reversed in schizophrenia, where the right hemisphere-based overview is supplanted by the left hemisphere’s detail-focussed view.

The right hemisphere gets the form, the shape, the whole: the left hemisphere gets the bits and pieces.


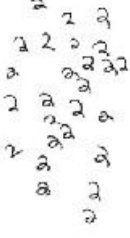

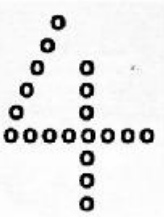
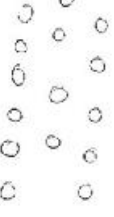

Target stimulus	LH intact	RH intact
		
		

Fig. 7. Drawings of targets from memory, in right hemisphere-damaged (centre) and left hemisphere-damaged (right) patients (examples from author's clinical material)

When the right hemisphere is damaged, things fall apart. For example, if asked to draw a person, subjects with damage to the right posterior hemisphere can't put the bits together, but, in repeated attempts, put the limbs in the most extraordinary places.

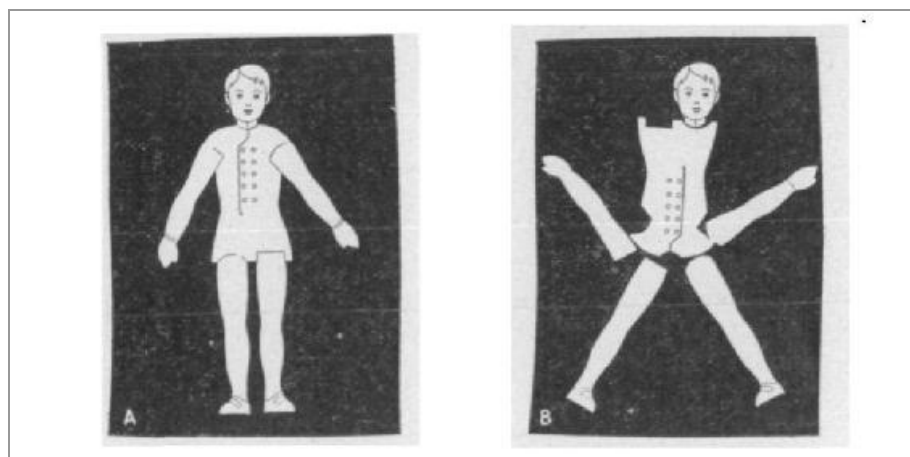


Fig. 8. Assembling a mannequin from parts: (A) correct configuration; (B) attempt by patient with right posterior tumour (from McFie, Piercy & Zangwill 1950)

Whereas subjects with autotopagnosia (see below), following left hemisphere damage, retain the overall form, but not the pieces, right hemisphere-damaged subjects retain the pieces, but not the overall form. One patient, asked to draw an elephant, can draw the parts separately – a trunk, a tail, an ear – but can't put them together to form a recognisable animal. He is no better able if given a model of an elephant to assemble. In general, the overall shape is lost and attention is focussed on one or two features which are thought to identify the item.¹⁴⁸

This loss of the whole at the expense of the parts is reflected in the fact that the hemispheres 'see' the body, too, in different ways. One difference is that the left hemisphere sees the body as an object 'out there' in space alongside other objects, while the right hemisphere feels the body to be what we experience as a whole 'from the inside'. What is conventionally called the body image, but which I will henceforth call the body schema, is in the right hemisphere. I change the terminology because this is not, as in common parlance, just a visual image, but a multimodal image of the body, as experienced, and taken as a whole.

Devitalisation is also sometimes dramatic. With the right hemisphere no longer available to bring the left side of the body into awareness, the left hemisphere may substitute only a structure of mechanical parts down that side. One patient described by the Austrian neurologist Hans Ehrenwald reported that, following a right hemisphere stroke,

where the left half of his chest, abdomen and stomach should be, a plank has been inserted. It goes right down to his anus, is divided into compartments by crossbeams, and has a hole in its undersurface. Food doesn't pass in the usual fashion through the stomach and intestines, but is pumped into the compartments of the shelving and passes out by the hole at the bottom. All that applies only to the left half; on the right side, all the organs are in order. He runs his hand gloomily over the left side of his chest, and points: 'Here is the plank: there's no mistaking it. You can feel it clearly under your hand.'¹⁴⁹

That alerts us to another thing we notice in the accounts of their bodies by patients with right hemisphere disorders: how often the offending body

part is mistaken for an *inanimate object*, either dead or never alive. This is not just a way of saying it is not functioning. People with left hemisphere strokes almost always recognise the paralysed arm as part of the self and want to rehabilitate it. People with right hemisphere strokes sometimes see it as another person altogether, and give it a nickname – Floppy, Dopey, Johnny – but more often see it as not alive – or *never-alive*.¹⁵⁰ Thus a patient may declare ‘I don’t know what the hell it is!’, before deciding it is ‘dead wood’.¹⁵¹

Ehrenwald published accounts of several left-hemiplegic patients (therefore with right hemisphere lesions). One patient’s left hand was ‘as long, as dead and as lifeless as a snake’; another found that his left extremity was ‘alien, dead ... utterly lost to him’.¹⁵² A third

complained of feeling that his body was becoming more and more divided into parts, that he was losing it bit by bit ... ‘Where can my body have gone? All there is here is debris that I don’t recognise.’¹⁵³

And for yet another:

even the internal organs of the left half of the body appear altered, in fact are completely non-functioning; and are replaced, as he puts it in delusional fashion, by a lifeless mechanism, alien to the body – part of the external world.¹⁵⁴

The emotional alienation involved here is either directed at a body part, or at the whole body. But sometimes, after right hemisphere stroke, as part of the general hollowing out of emotion, there can be an alienation from the self as a whole, from the subjective stance that guarantees personhood. Thus Ehrenwald describes a young woman who, following a right hemisphere stroke, started to speak of herself only in the third person.¹⁵⁵ This is a not uncommon finding in autism; and occurs by implication in schizophrenia, where third-person auditory hallucinations, in which voices do not speak *to* the subject, but *about* him or her, are considered a ‘first rank’ symptom.¹⁵⁶ It appears to signify a loss of the unreflective,

spontaneous grounding of the self in the world, without which nothing any longer seems real.

There is an intuitive connexion between cutting things up into parts and their being no longer alive, which is borne out by brain functioning: a failure of global processing, as in right hemisphere damage, impairs recognition of living things, while a failure of local processing, as in left hemisphere damage, impairs recognition of non-living ones.¹⁵⁷ And there is a particular affinity of the left hemisphere for both inanimacy and analysis into parts. It is the left hemisphere alone that codes for non-living things, while both hemispheres code for living things – though the right hemisphere has an advantage for the living;¹⁵⁸ at least one study has found a clean divide between the hemispheres, the left coding for the non-living, and the right for the living, regardless of the task.¹⁵⁹ Another found that responses selective for animacy arose only in the right hemisphere, and that animals and non-animals formed ‘distinguishable clusters in the population code of the right, but not left, amygdala’;¹⁶⁰ yet another that animals’ names and appearances activated preferentially the right hemisphere, especially the temporal region, and conversely that names and appearances of inanimate objects and, especially, tools, preferentially activated the left hemisphere, especially the left temporal region.¹⁶¹ A subject with schizophrenia, which mimics right hemisphere deficits, reported ‘I had a sort of fascination about waxworks, surreal imagery.’¹⁶² And body parts – like ‘cut up’ bodies – sort with *inanimate things*.

Moreover, there is such an affinity between the left hemisphere and tools, and actions of grasping, that just referring to tools or grasping activates the left hemisphere, *even in left-handers*, despite the fact that left-handers habitually use the right hemisphere (left hand) to grasp objects and use tools and instruments in daily life.¹⁶³

Instruments are the natural province of a hemisphere whose concern is manipulation of the environment, whose concern is ‘instrumental’. Of all things, machines can best be understood partwise: they were made by us, we put them together from parts, and we know therefore the purpose for which they were designed. Living things, however much we may have got used to thinking of them in this way, are not machines: we didn’t make them, they were never just ‘put together’ and they don’t have an instrumental purpose. And as a further demonstration that the distinction

involves manipulation, ‘instruments’ of the musical variety, which are not actually ‘instrumental’ in the philosophical sense, have repeatedly been found to sort in the brain, not with inanimate objects and tools, but in the right hemisphere with living things.¹⁶⁴ The musician ‘does not only manipulate the instrument like a separate object, but lives in it like a limb and inhabits the expressive musical space it opens’.¹⁶⁵ Impaired recognition of musical instruments – whether by sound, sight or concept – is associated with damage to the right superior temporal gyrus.¹⁶⁶

By way of illustration, Amy Belfi and colleagues presented a contrasting pair of cases. A subject with left frontotemporal damage was almost perfect (94%) at recognising musical instruments but poor (33%), as one might expect, at naming them. A subject, however, with right parietotemporal damage was 100% correct at naming, but only 44% correct at recognising; she incidentally demonstrated what is called superordinate categorisation, typical of the left hemisphere – eg, saying ‘musical instrument’ for ‘flute’.¹⁶⁷ the loss of fine discrimination.

In the absence of the left hemisphere, things come alive. In a study in which subjects had one or other hemisphere suppressed, those with their left hemisphere suppressed were ‘like young children or representatives of archaic societies’, in that they attributed life to a watch ‘because it goes’, or the moon because it moves across the sky, or to a stone ‘because electrons rotate within it’.¹⁶⁸ They were natural animists. Animacy comes from appreciation of a human context, something at which the right hemisphere is superior to the left. In his work with the Ojibwa, an indigenous people of North America, anthropologist Pete Hallowell discovered that many words for inanimate objects are within the animate noun category.¹⁶⁹ He explained that not *all* stones are considered ‘alive’ within Ojibwa society. but that their aliveness emerges through involvement with others; they are alive ‘through their position within a relational field’.¹⁷⁰ This immediately suggests right hemisphere ontology.

The corollary, that right hemisphere suppression causes the living to appear inanimate, is demonstrated by the account of patients with right – particularly right parietal – damage. One such woman, who was not depressed, reported that

sometimes I do not seem to know who I am, I doubt my own existence, I feel like a piece of furniture. I do not feel either a human being or an animal. I can feel the heat and the cold, but at the same time it feels very weird. I walk, but I just cannot convince myself that I am walking, as I have this feeling as if I could not move, as if I was a piece of furniture.^{[171](#)}

In the two above examples, the association of animacy with motion, and of inanimacy with stasis, is made explicit: the link is both intuitive and present at the level of hemisphere difference.

Finally, I mentioned that it is easier for the right hemisphere to adopt the attentional role of the left, if required, than for the left hemisphere to adopt the role of the right. This asymmetry is by no means limited to attention. After severe infantile damage to the left hemisphere, language can develop in the right hemisphere; but the left hemisphere is more rarely able to take over after damage to the right.^{[172](#)} There is active inhibition of right hemisphere language by the left hemisphere, which comes to light when the left hemisphere is suppressed; if the inhibitory effect of the left hemisphere is attenuated or suppressed, the right hemisphere proves to have a considerable vocabulary, including long, unusual and non-imageable words.^{[173](#)} The reverse phenomenon, that, eg, facial processing, a typical right hemisphere function, is released in the left hemisphere when the right hemisphere is temporarily inactivated ‘remains inconclusive’.^{[174](#)} If the left parietal lobe is ‘knocked out’, the right parietal can do its job, but not the other way round.^{[175](#)}

According to one research group, findings

suggest that the right hemisphere contributes to the development of left hemispheric function. Moreover, the right hemisphere and its functions ... develop earlier than those assigned to the left hemisphere, as confirmed by a recent functional imagery study.^{[176](#)} Putting all the findings together, the right hemisphere seems to have a “nurturing” function for the development of the left hemisphere ...
^{[177](#)}

The Master appoints and nurtures his emissary.

The right hemisphere is dominant in human infants,¹⁷⁸ and in the first years of life.¹⁷⁹ In a study of cause and effect connectivity between cortical structures, researchers found that first, overall, and in opposition to the clichéd presumption, there was not only a dominance of top-down over bottom-up causation, but of the right hemisphere over the left.¹⁸⁰ And second, they found that the right ventrolateral prefrontal cortex had more impact on the function of the rest of the brain than any other single area in the brain, with effects especially on the right frontal pole generally, and the left ventrolateral prefrontal cortex, as well as on both right and left amygdalae and hippocampi. As far as top-down causation was concerned, the only exception was an excitatory influence of the right hippocampal formation on the right frontal pole and right amygdala. Another study found an excitatory influence of the right amygdala on ‘higher’ centres in both sides of the brain.¹⁸¹ It looks like the right hemisphere, particularly the right frontal pole, but also, interestingly, the ‘lower’ areas, such as the right amygdala and hippocampus, are critical to our maintaining a sense of reality.

This merely adds to the evidence that I discussed in *The Master and his Emissary* at considerable length that the right hemisphere is primary in the bringing about of the experienced world.

SUMMARY

Attention does not just change things in some rather nebulous way. Attention is responsible not just for the *how* (though it is), not just for the *what* (though it is), but, as far as the left hemisphere is concerned, for the *whether-at-all* of existence. What it doesn't attend to, as far as the left hemisphere is concerned, doesn't exist.

Left hemisphere attention is sharply restricted in space and time, which is, after all, the four-dimensional world in which we live. It tends towards precision, but at the expense of depth. It is no longer true to the expansive, always moving, always changing, endlessly interconnected nature of reality. One way of putting it is that the left hemisphere can provide some sorts of knowledge *about* the world, as it would be scrutinised from a certain theoretical point of view effectively outside the realms of space and time (as on a map); whereas the right hemisphere provides us with the knowledge *of* the world in space and time (as experienced). Constraining attention, left hemisphere fashion, makes coherent wholes dissolve, and brings things to a standstill: reality leaches out.

The left hemisphere's limited appreciation of depth in space and time is in keeping with its tendency towards stasis. It seems to lack appreciation, not just of motion, but of emotion; it relatively lacks appropriate emotional depth, or concern, tending to be irritable or facetious, especially when challenged. It tends to disown problems, and pass the responsibility to others; is overconfident about what it cannot in the nature of things know much about; fabricates (often improbable) stories to cover its ignorance; sees parts at the expense of wholes; tends to see 'from the outside', rather than experience 'from the inside'; and has an affinity for the inanimate, and for tools and machines in particular.

It is also quite confident it is right.

PERCEPTION

Thinking is more interesting than knowing, but not than looking.

—*Johann Wolfgang von Goethe*¹

To repeat: don't think, but look!

—*Ludwig Wittgenstein*²

PERCEPTION IS NOT THE SAME AS ATTENTION, AND NOT AT ALL THE SAME AS thinking. But the world we choose to attend to, indeed choose whether and how to attend to, is nothing without perception. 'We live in two worlds, the world of sight and the world of thought', wrote Friedrich Max Müller, one of the most celebrated philologists of the nineteenth century, 'and, strange as it may sound, nothing that we think, nothing that we name, nothing that we find in our dictionary, can ever be seen or heard, or perceived.'³ Perception is the act whereby we reach out from our cage of mental constructs to taste, smell, touch, hear and see the living world.

Let's begin by turning to perception in the most basic possible sense: the capacity of each of the senses to make discriminations, and thus help us to bring about a world of experience at all. How veridical is the perception of either hemisphere? Which should we be more prepared to trust?

At first, the brain's capacity for divided attention was almost wholly in the service of perception – in *either hemisphere*. It was devoted to delivering sensory information about the world, through eyes and ears and

touch, and through the sense of smell. And this need for immediate sensory information of the highest quality in both hemispheres goes on a very long way up the evolutionary tree, almost as far as human beings. Almost – but not quite. Because in us something new happens: to be precise, it starts happening in the great apes. It is the ability to use symbols – tokens or representations for things. And in humans it is advanced out of all recognition by language, which gives us a virtually inexhaustible way of mapping the world, to which perception is, to all intents and purposes, irrelevant – and from which it may even prove a distraction. Sensory perception goes on, of course, in each hemisphere, but it becomes of comparatively less importance for the cortical left hemisphere, now devoted to re-presentation.

HEMISPHERIC DIFFERENCES IN NORMAL PERCEPTION

Perception is not naïve: we do not cobble together independent stimuli – white fur, long ears, whiskers – to form a rabbit. We see the hat, and we expect a rabbit even before it appears. When we see what are conventionally thought of as different ‘percepts’, we are already going to meet them with an image of our own – we see them as part of a whole that comes into being at once together. Here again the right hemisphere has the advantage since its capacity to see the whole is reflected in greater interregional connectivity in the right hemisphere, whereas the left hemisphere is better at processing ‘simple, unimodal stimuli’.⁴ Tasks that involve integration across sensory modalities are significantly harder for patients with right hemisphere than left hemisphere damage, whatever the modalities in question.⁵

To be good at perceiving is to be good at *integrating* information. It is bound up with widespread brain function, particularly with preparing to act or simulating action – not just, or even mainly, as a *consequence* of perception, but as a *basis* for perception. For example, monkeys with bilaterally intact visual (striate, prestriate and temporal visual) cortices became nonetheless functionally blind after the removal of areas of *non-visual* cortex which respond to sight.⁶ Or speech: obviously, listening to speech affects the power of speech, but does the power of speech have an effect on the capacity to hear speech? It seems so.⁷ Disrupting premotor cortex disrupts the perception and understanding of action language, as well as its execution.⁸

Merleau-Ponty saw perception as a reciprocal encounter. It is a position I strongly defended in *The Master and his Emissary*. Experience is a sensorimotor – and intuitive – participation, a fusion of one’s own awareness with awareness in the world. Speaking of his perception of the blue of the sky, Merleau-Ponty wrote that ‘I abandon myself to it and plunge into this mystery, it “thinks itself within me”...’⁹ Perception is not passive reception, but participation. (As is all consciousness, but that is a story for later.)

The insight that the right hemisphere is better at perception has a long history. As long ago as 1864, only three years after Broca’s first papers

describing the case of ‘Tan’, a subject with a left frontal lesion accompanied by aphasia,¹⁰ and thus signalling the beginning of the modern understanding that the brain hemispheres were different in nature, John Hughlings Jackson, the father of British neurology, wrote: ‘If, then, it should be proved by wider evidence that the faculty of expression resides in one hemisphere, there is no absurdity in raising the question as to whether perception – its corresponding opposite – may not be seated in the other.’¹¹ He was referring to speech expression and speech perception, but 10 years later he added visual perception: ‘the posterior lobe – or let us speak more generally – the hinder part of the brain on the right side, is the chief seat of the revival of images in the *recognition* of objects, places, persons, &c.’¹² And, astonishingly, in the earliest known speculation on the nature of hemisphere difference, Greek physicians in the third century BC already held that the right hemisphere was specialised for perception.¹³ This was in an era when there were very few brain scanners. Recent research strongly bears out their insight.

Visual perception

The right hemisphere has in fact been shown to be better at a whole range of pre-cognitive aspects of vision. It is superior at stimulus detection and localisation, as well as depth detection; it is more accurate at size estimation, and better at orientation matching, adapting to orientation, and detecting small differences in line orientation.¹⁴ It is also better, which may come as a surprise, at visual (hyper)acuity: it performs better at Vernier tasks (requiring the ability to discern a slight misalignment between two line segments or gratings).¹⁵ As we have seen, unlike the left hemisphere, which knows how to categorise a spatial point (above, below, to the right, to the left, of something else), the right hemisphere knows where it actually is – its spatial co-ordinates, if you like.¹⁶ It is better at pattern recognition.¹⁷ In addition, patients with right hemisphere damage are far more likely than their left hemisphere-damaged counterparts to have difficulty separating figure from ground, or real contours from shadows;¹⁸ and in contour detection,¹⁹ as well as recognising objects from unusual angles, or from incomplete information.²⁰ The right hemisphere is far superior in mental

rotation – which involves thinking in three dimensions, not two.²¹ ‘The right hemisphere’, writes Gazzaniga,

is easily able to do tasks that involve discriminations that are spatial in nature, such as detecting whether two images are identical or mirror-reversed, detecting small differences in line orientation, and mental rotation of objects, while the left hemisphere is dismal at these assignments ... It also turns out that the right hemisphere is exceptional at perceptual grouping. For example: if you show partially drawn figures to the right hemisphere, it can easily guess what they are, but the left hemisphere can’t guess until the figure is nearly completely drawn.²²

It has been suggested that the right hemisphere’s ability to see the whole somehow depends on its (undoubted) ability to deal better with incomplete information. But it seems likely that the effect works the other way round: it can deal with incomplete information, because it sees the whole. For example, in a study in which the right hemisphere was shown to be superior at contour detection, ‘contour and non-contour stimuli had the same spatial frequency spectra ... the results challenge the view that the right hemisphere advantage in global processing depends on a specialization for processing low spatial frequencies’. A term such as ‘spatial frequency’ can easily be off-putting, but in everyday parlance it means how much information is present. Low spatial frequency means not much information is present, so you have to do extra work to make out what you are looking at. And according to a critical survey of the area in the same paper, ‘the right hemisphere’s predominance in spatial-frequency analysis is, apparently, only a manifestation of its special competence in various perceptual functions’.²³ The point being made by the authors of the paper is that this is just one more way of demonstrating that the right hemisphere is better at *reading* the stimulus, across various perceptual modalities, since, when the signal is easy to read, the left hemisphere is slightly quicker at detection (it tends, compared to the right, to jump to conclusions), but when the signal is any way degraded, partial or hard to read, the right hemisphere is more accurate.

Even this partial left hemisphere advantage is true only for brief exposures, since with longer exposure, there is ‘a trend to a right hemisphere advantage irrespective of the [spatial frequency] content’.²⁴ In other words, if you want an accurate assessment rather than a quick one, the right hemisphere is to be preferred. In fact there is evidence that the left hemisphere gets less reliable as you give it more time to respond – perhaps because it is then prone to rely on conscious processing, which immediately limits possibilities.²⁵ Nonetheless, interpretation of ‘low spatial frequency’, giving the intuited whole, comes first, courtesy of the right hemisphere, and ‘high spatial frequency’, focus on detail, comes later, courtesy of the left.²⁶

And here I’d make a general reflection on the psychological literature on hemisphere difference to date. The left hemisphere has got a long way on its reputation as the bright one precisely because of its speed. In the lab, ‘superiority’ at a task very often means being able to do it *quicker*. But right across the board there is a pretty significant rider to this. The left hemisphere is faster, where it *is* faster, as long as the stimulus is clear, and familiar, and a stock response is required. What has been demonstrated time and again is that if there is any ambiguity or uncertainty about the stimulus, or it is unfamiliar, or the stock response is not what is required, it is the right hemisphere that is more accurate. The right hemisphere’s devil’s advocate tendencies – ‘is there another way of seeing this?’ – lose it the lead by milliseconds when the response needs to be quick and dirty. But they win out everywhere else, where a more thoughtful response is required, because the right hemisphere is more in touch, more nuanced in weighing up what is going on, and more insightful across the board.

Incidentally, some doubt has been cast on the validity of tests carried out using cathode ray tube displays (which until recently much of the research corpus has been), because they deliver a greater luminance in the right visual field, the province of the left hemisphere. Since greater luminance carries an advantage in reaction time, and typical interhemispheric differences in reaction times are small, this is potentially significant; and one study claims to have ‘shown that previous reports of right visual-field [left hemisphere] advantages for vocal responses are an artefact of the luminance asymmetry of computer screens’.²⁷ According to Nowicka and Tacikowski’s review of the area, ‘unfortunately this report has been largely overlooked by the neuroscience community, despite the fact

that luminance asymmetry could have substantial implications for the interpretation of the findings of many studies'.²⁸

All in all, the left hemisphere is less reliable in perceptual interpretation of experience, which goes with its being more likely to jump to conclusions, getting it right when the stimulus is predictable, but wrong when it is not; the right hemisphere is more cautious, and more reliable in the long run. Of which more presently.

The human brain can make very fine discriminations of colour. Those with normal colour vision experience a vastly rich colour spectrum, with estimates of, conventionally, 2–3 million discernibly different colours that may be seen together in an 'almost infinite' number of possible combinations.²⁹ Indeed, according to one recent study, 'a more realistic if conservative number of distinguishable object colour stimuli' is about 40 million.³⁰ Amongst the many pre-cognitive aspects of vision at which the right hemisphere excels is colour perception and brightness sensitivity.³¹ The perception (as opposed to naming) of colour in mental imagery under normal circumstances activates only the right fusiform area, not the left;³² and imaging studies, lesion studies and neuropsychological testing all suggest that the right hemisphere is more attuned to colour discrimination and perception.³³

A further difference is the way the two hemispheres deal with imagery. Since the left hemisphere is less in touch at the perceptual level, its world is more abstract or conceptual – generalised and theoretical.³⁴ Its views are hardly *views* at all, but 'abstract, view-independent representations', presumably derived from real-life views taken by the right hemisphere: according to Patrik Vuilleumier and colleagues,

left fusiform neurons might code for view-independent conjunctions of characteristic features, whereas right fusiform [neurons] might represent complex features in a view-specific (but scale-invariant) holistic manner.³⁵

In Aristotle's view, ideal exempla are simply derived from real-life instances, shorn of individual features and context. On this view, the left hemisphere 're-presents' a digest of the specific views presented by the right, with all their complex features and holistic roundness neatly excised.

However, references to specific points in real space are, as Stephen Kosslyn points out, more useful for getting around in the world than theoretical generalisations: ‘one needs to know about the specific case, not its general category’. According to him, it is the right hemisphere that primarily produces ‘vivid, in-context, external’ images, while the left hemisphere primarily deals in ‘non-vivid, out-of-context, internal’ images.³⁶ One revealing detail: while there is no left hemisphere advantage for recognising objects in general – rather the opposite – there is such an advantage for recognising *tools*.³⁷

Auditory perception

The greater part of our perception of the world comes by sight. What about the other senses? The human ear can discriminate, it is said, 340,000 tones.³⁸ Pitch discrimination, as well as some other aspects of tone processing, has repeatedly been found to be superior in the right auditory cortex,³⁹ by contrast with the processing of meaningless noises, such as clicks, in which there is a left auditory cortical advantage, a difference thought to relate to its specialisation for language.⁴⁰ The right posterior superior temporal area has in particular been noted to play a key part in a range of auditory processes, including the inflection of speech,⁴¹ the timbre of the voice,⁴² and phrasing.⁴³ In both music and speech, melody, tone and pitch-processing,⁴⁴ as well as harmony in music,⁴⁵ are almost always mediated via the right hemisphere. Rhythm and metre in speech, and complex musical rhythm, are also right hemisphere mediated.⁴⁶ However, basic metrical rhythms are mediated by the left hemisphere, particularly by Broca’s area.⁴⁷

All of this is true of non-professional musicians only. Professional musicians have a more bilateral representation of music (see *The Master and his Emissary* for discussion of possible reasons).⁴⁸

Auditory rhyme probably requires both hemispheres:⁴⁹ one of the effects of callosal agenesis – congenital absence of the entire corpus callosum – is the loss of appreciation of rhyme.⁵⁰ It seems that a connexion between left and right inferior frontal gyri is necessary.⁵¹ However, the right posterior superior temporal gyrus may again play the key part.⁵²

In addition, the right hemisphere specialises in ‘higher-order processing’, integrating the whole of auditory space, and enabling absolute (as opposed to relative) localisation of a sound – ie, just as with vision, knowing where the perceived stimulus actually is.⁵³ Lesions to the left parietal lobe have some effect on the localisation of sounds coming from the right, but right parietal damage disrupts the spatial processing of *all* sounds, whether from left or right – a finding which is in keeping with what we know of the hemispheres’ different attentional fields.⁵⁴

Olfactory and gustatory perception

The acuity of eye and ear is, however, as nothing to that of the nose. An estimate of a lower limit of 1,720,000,000,000 (otherwise known as 1.72 trillion), for the number of olfactory stimuli that humans can discriminate is apparently, I was abashed to learn, conservative.⁵⁵ The characteristic scent of a rose, for example, is produced by a blend of not, perhaps, five, or 15, but 275 components, none of which on its own smells like a rose.⁵⁶ A considerable body of evidence suggests that olfactory recognition and discrimination are preferentially carried out in the right hemisphere, ⁵⁷ especially the right orbitofrontal cortex, though, oddly enough, emotional reactions to scent may be stronger in the left hemisphere, possibly a relic of its role as predator.⁵⁸

Apart from five very basic tastes – salt, sweet, sour, bitter and umami – which come from the tongue, all flavours come from the olfactory sense. In a test of wine recognition, control subjects showed activations predominantly in the right hemisphere. Wine experts, however, used both hemispheres, and at times relied more heavily on the left hemisphere. The investigators put this down to the fact that they ‘work simultaneously on sensory quality assessment and on label recognition of wine’.⁵⁹ Or at any rate, naming.

Tactile perception

The sense of touch is superior in the left hand (right hemisphere);⁶⁰ the right hemisphere is generally more sensitive to tactile stimuli, ⁶¹ and

complex tactile stimuli are better read by the right hemisphere than the left.⁶² Feelings of warmth, and temperature discriminations in general, are associated with right hemisphere activation.⁶³ Visual discrimination of texture depends on the right posterior parietal cortex in humans (as it does in rats), although one report suggests the left parietal region may also play a role.⁶⁴ The ability to perceive the workings of the body internally, known as interoception – for example, awareness of one’s own heart beat – is right hemisphere (specifically, right insula) mediated.⁶⁵

And remember, even perceptual links between *words* are also made primarily by the right hemisphere.⁶⁶

So much for primary sensory perception.

Local vs global perception

One important element in perception is the ability to make sense of a stimulus using contextual information. This requires a swift capacity to synthesise bottom-up, local, information, with top-down, holistic, information, a process that depends principally on the right hemisphere. Patients with brain lesions who show perceptual organisation deficits commonly have damage to the right temporal lobe or right temporoparietal junction,⁶⁷ and less commonly to the right frontal lobe.⁶⁸ While the left hemisphere underwrites local attention, the right hemisphere underwrites global attention, as we saw in the previous chapter – *and* the ability to switch between them.⁶⁹

This last ability is easy to pass over. But it’s not just another technical difference between the hemispheres. It inevitably makes a difference to the world we *perceive*. What it means is that *both* to perceive the form of something as a whole, *and* to see it differently from the way you are accustomed to see it, depends on the way of taking in the world that is underwritten by the right hemisphere of the brain. If you think and adopt the way of being of the left hemisphere world, not only will you struggle to see the overall shape, but you won’t be able so easily to switch – or even be aware that you can. If someone else tells you they see something quite different there, you might well, sincerely but wrongly, believe that they must be mistaken.

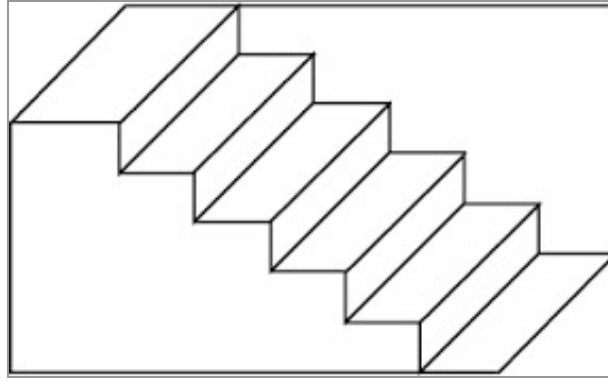


Fig. 9. Bi-stable image of stairs (from Schröder 1858)

There is something known as perceptual rivalry, which is the antagonism between conflicting interpretations of a bi-stable image (an image that has two possible stable configurations) such as Schröder's stairs (Fig. 9) – are we looking at the stairs from above and to the right, or from below and to the left? Normally we can flip between percepts more or less at will. One special case of perceptual rivalry is binocular rivalry, where it is not that the same image is seen by both eyes (while allowing more than one interpretation), but that the images given to each eye are different – and not strictly compatible.

Bi-stable percepts engage primarily right hemisphere (frontoparietal) networks, but also to a lesser extent left hemisphere regions, which is what one would expect, on the basis of interactive competition between the left hemisphere's need to achieve a single stable result, and the right hemisphere's attempt to free things up and see other possible alternatives. What is critical, though, for both to be of use, is the part played in this process by being able to switch, or 'unstick', perception. EEG evaluation (electroencephalography, a measure of regional brain activity using leads, taped to the scalp, to monitor the brain's electrical activity) is superior to functional neuroimaging whenever one is looking at something in which split-second timing is crucial: EEG measurement shows that the right inferior parietal cortex is the key area that activates just prior to a perceptual reversal.⁷⁰ fMRI, or functional magnetic resonance imaging, gives detailed evaluation of which areas are active, but does so over 'time slices' that are usually several seconds thick, where EEG gives an instantaneous record. Having said that, in this case a virtually identical result was in fact achieved using fMRI, also implicating the right inferior parietal cortex.⁷¹

A large majority of other studies have reported, in the words of one research group, that ‘activity specific to the rivalry condition was strongly lateralized to the right hemisphere’, implicating more specifically right inferior and superior parietal regions, and right inferior frontal cortex, including the insula, as of critical importance to switching.⁷² In addition, lesion studies show that right hemisphere-damaged, but not left hemisphere-damaged, individuals have problems with binocular rivalry.⁷³ Moreover, temporarily suppressing the posterior right parietal cortex using transcranial magnetic stimulation (TMS) in normal subjects disrupts its capacity to facilitate perceptual shifts.⁷⁴ (TMS is a non-invasive procedure, which employs a hand-held magnetic coil to stimulate or suppress, depending on the frequency of pulses delivered, the activity of the underlying cortical area.)

Thus the right hemisphere makes it possible to switch interpretations, whether between interpretations of what both eyes see, as in the stairs (perceptual rivalry), or between what each eye sees (binocular rivalry); and right hemisphere damage makes it hard to switch, in line with what I call the stickiness of the left hemisphere.

The ability to see the whole, to make sense of percepts in terms of knowledge about the real world, to see how to group things together to make sense, to see global forms and complex images, improves with age and experience, reaching normal adult levels only by late childhood at the earliest, and for some aspects not till adulthood itself: experiments with complex visual displays show that in normal adolescents perception is biased toward representing local elements rather than perceiving the whole.⁷⁵

THE HEMISPHERES AND PATHOLOGIES OF PERCEPTION

So much for the normal functioning of the brain in perception. What does abnormal functioning tell us?

Patients with brain lesions who show deficits of perceptual organisation generally have damage to the right temporal lobe or right temporoparietal junction,⁷⁶ less commonly to the right frontal lobe.⁷⁷ Some patients with Alzheimer's disease exhibit deficits in perceptual organisation, and such patients usually have greater right hemisphere involvement in the disease.⁷⁸

Not to see the whole is to see things out of context. For this we depend on the right hemisphere, which has the capacity to integrate extraordinary amounts of information over many areas. This capacity is embodied in the physical structure of the right hemisphere, whose anatomy and neuronal structure are more suited to holistic, 'summative' processing than that of the left hemisphere.⁷⁹ There appears, even, to be a right hemisphere advantage for holistic *word* processing, despite the clear left hemisphere advantage in language comprehension overall.⁸⁰

Although I have referred to them separately, respect for context implies respect for embodiment – itself an important 'context' – respect for what is concrete and unique, being embedded in the world; similarly abstraction and generalisation inevitably move in the opposite direction, towards decontextualisation and remoteness from the embodied world in which we live. What about perception and the body?

It is widely accepted in clinical neurology that the right hemisphere is specialised for perception of the body.⁸¹ I have mentioned that the right hemisphere is more in touch with the body in the sense of having more profuse connexions with the limbic system, the ancient part of the brain that mediates emotion to 'higher' cognitive centres, and vice versa.⁸² Moreover the right frontal pole has a key role in regulating the hypothalamic-pituitary-adrenal axis, which is the neuroendocrine interface between the body and emotion, essential to our subjective appreciation of the body's physiological condition.⁸³ And pleasant or painful sensations of temperature, pain from muscles and abdominal organs, awareness of heart beat, sensual touch and sexual arousal all produce predominantly activation in the anterior insula of the *right* hemisphere.⁸⁴

‘Several lines of evidence suggest’, writes Orrin Devinsky, Professor of Neurology at New York University, in a review of the subject, ‘that the right cerebral hemisphere is dominant for the sense of physical and emotional self, specifically, for an individual’s awareness of his or her own corporeal being and its relation to the environment and affective state’.⁸⁵ That’s quite a chunk of reality. Specifically the right hippocampal formation is, according to Boris Velichkovsky, ‘unique in its holistic representation of surrounding space, which seems to function as the common interface for the bodily “self” as well as for higher-order thought and feelings.’⁸⁶

What about other aspects of the self?⁸⁷ The right hemisphere, especially the right inferior parietal lobe, is of vital importance for our awareness of self, beginning with the physical self, but going beyond that.⁸⁸ As I have suggested elsewhere, though clearly neither hemisphere can on its own constitute the self, the contributions to the ‘self’ from either hemisphere are distinctively different. At the risk of over-simplification, the objectified self, and the self as an expression of will, is generally more dependent on the left hemisphere; whereas the self as empathically inseparable from the world in which it stands in relation to others, and the continuous sense of self, enduring over time, are more dependent on the right hemisphere.⁸⁹ The verbally self-interrogating self, ‘judging what is occurring, trying to figure out what that trait word means to the participant, whether it describes the participant, and allowing oneself to become caught up in a given train of thought’, the verbalising, self-scrutinising and discursive self, is associated with medial prefrontal cortex in both hemispheres, as well as left hemisphere semantic networks; whereas the ‘experiential’ self, the ‘self in the present moment’, the self ‘sensing what is occurring in one’s thoughts, feelings and body state, without purpose or goal, other than noticing how things are from one moment to the next’, the self that is recruited by mindfulness, is associated with widespread right hemisphere activations (see Chapter 28). These forms of self are usually integrated, but can be dissociated by experts in mindfulness, with the first diminishing, and the second increasing.⁹⁰

My goal throughout this section of the book is to determine how in touch each hemisphere is with reality. It is an important observation, then, that the boundaries of the self,⁹¹ and the coherence of the self over time, are maintained by the right hemisphere.⁹² In right hemisphere damage, and

not uncommonly in schizophrenia, subjects can lose the coherent sense of a self, and even feel themselves melting into another person, so that parts of their own and other bodies become confused – which leads us to how the perceptual world changes when there is damage to the right hemisphere.

The right hemisphere seems embedded in the world, whereas the left hemisphere is intrinsically abstracted from the world. It is just less ‘in touch’. If so, what results when the right hemisphere is no longer available to correct the left hemisphere’s lack of grasp of perceptual reality?

In a word, pandemonium (see Plate 4).

In the largest systematic study to date of the nature and lateralisation of brain lesions giving rise to anomalous altered perceptions – broadly speaking, to illusions and hallucinations – John Cutting found that right hemisphere lesions are ‘critical’.⁹³ In his analysis of almost 200 cases, 73% were due to right-sided lesions.

While hallucinations are a matter of perception, and delusions are a matter of belief, it is interesting that Braun and Suffren, in their survey of delusional disorders, carried out entirely independently in the same year as Cutting’s, 2011, found exactly the same proportion: 73% due to right-sided lesions.⁹⁴

When one looks at the evidence regarding *de novo* psychosis following temporal lobectomy, the figure is 77% due to right-sided procedures, 23% due to left-sided procedures.

These percentages understate the situation, because the more serious disturbances tend to follow right hemisphere lesions. Take the nature of the perceptual alterations noted by Cutting. In cases with right hemisphere damage there are anomalies of shape, size, three-dimensional status, distance, permanence and emotional value, and disruptions of what can only be described as a sense of ‘reality’ itself. By comparison, in the left hemisphere damage cases there are only two obvious effects: ‘geometrical displacement and changes in emotional value’. In fact the situation is even more striking than Cutting lets on by this formulation, since the displacement is just that, not a distortion; and the only two examples he gives of alteration to emotional value following left hemisphere damage both demonstrate an *increase in the intensity of the sense of reality*.

Visual hallucinations and distortions

Let's begin by looking at visual hallucinations. Two studies looking at a total of 31 visual hallucinations of organic origin (ie, cases in which a brain lesion was discovered that underlay the phenomena) each found that the hallucinations were caused by damage to the right hemisphere in almost 90% of cases.⁹⁵ A study of epileptic foci giving rise to visual hallucinations by Wilder Penfield found that 10 out of 11 were associated with right-sided brain deficits, and 'stimulation produced these illusions only in the minor hemisphere for handedness'.⁹⁶ A further study by the French psychiatrists Pierre Mouren and Arthur Tatossian found that the preponderance of damage to the right hemisphere was 'clear-cut'.⁹⁷ Amongst other cases, they describe a man with a right parieto-occipital lesion who clearly saw, amongst other things, a pine tree that he knew he had cut down five years previously. He also experienced, in keeping with the lesion being in the right hemisphere, disappearance of the left half of his body, and denied he had any illness.⁹⁸

A systematic, but not exhaustive, review of the literature on specifically visual hallucinations to date carried out by myself for these purposes reveals that in those cases (99) where a clear focal lesion can be implicated for a pure visual hallucination, 88% were located in the right hemisphere, and 12% in the left hemisphere.⁹⁹ Three localisable cases involved circumscribed lesions in both hemispheres, and were not included.¹⁰⁰ I have also not here included cases exclusively of metamorphopsia, nor AiWS, the so-called Alice in Wonderland syndrome (both of which are overwhelmingly due to right-sided lesions), because I will be dealing with them separately in the next few pages. Some epileptogenic foci in the left hemisphere interestingly involve visual hallucinations of *words*.¹⁰¹ (Words intruding into visual images are common in schizophrenia.)

On its own, the left hemisphere has problems with the realm of the visual. Distortions of space of all kinds, starting with the simple matter of size, are much commoner after right hemisphere damage,¹⁰² and visual distortions of shape often accompany prosopagnosia (inability to recognise faces), which is almost always a right hemisphere deficit. After a right hemisphere stroke, perception of images or lines may be tilted, either visually, or as a matter of proprioception (by the inner sense of bodily position), or to the sense of touch; as can be imagined, this is distressing and can hinder rehabilitation. It can happen after lesions in either

hemisphere,¹⁰³ but where this is serious it is usually, and where it is in more than one modality almost invariably (94%), a consequence of right hemisphere stroke, commonly involving the parietal area.¹⁰⁴ Interestingly, similar tilt distortions also occur not infrequently in schizophrenia: for example, one subject reported that ‘the houses on the street were all skewed, they no longer stood upright’.¹⁰⁵

Visual distortions are fascinating, but are rendered initially off-putting by portentous names beloved by neurologists. Putting it simply, things can appear transformed in some way (metamorphopsia), or the wrong size (dysmetropsia or dysmegalopsia) – that is to say, too large (macropsia) or too small (micropsia). They can also appear too far away (teleopsia) or too close (pelopsia). That’s most of it. Metamorphopsia is a handy umbrella term.

In one series involving visual distortions, 10 out of 13 cases had right posterior involvement.¹⁰⁶ Other cases of metamorphopsia have been generally due to right-sided dysfunction, very generally in the right occipital region (though in the right precuneus, an area of the superior parietal lobe bordering on the occipital lobe and also involved in vision, in one case);¹⁰⁷ and in some cases it is accompanied by other phenomena which are notably commoner after right hemisphere lesions. Reviewing cases of metamorphopsia, Tanja Nijboer and colleagues found that they are either unilaterally right-sided or, if not, bilateral.¹⁰⁸ As far as I know, only three cases have been reported following a *left* hemisphere lesion only, and in one of those the effects were limited to blurring of vision of objects in the right side of space.¹⁰⁹ Following a case report and literature review, Francesca Frassinetti and colleagues conclude: ‘we maintain that lesions causing dysmetropsia [metamorphopsia] involve the inferior portion of the right parastriate area.’¹¹⁰ That is to say, visual distortions are dependent on right, rather than left, posterior cortical dysfunction.

Alterations in size are known to be commoner after right than after left temporal lesions.¹¹¹ In the series reported by Mouren and Tatossian, what they call *microtéléopsie* (things appearing small and distant) was almost always associated with abnormalities in the right occipital region. One man had to keep braking when cycling because the road and the surroundings seemed small and very far away, as if stretched out into the distance. The door to his flat seemed too small to enter, and he went away rather than try

to go in, troubled as he was by the awareness that this was an odd thing to do. He described it as ‘like looking down the wrong end of a telescope.’¹¹²

Micropsia in just one half of the visual field, known as hemimicropsia, is a relatively common subset. In nine cases reported in eight separate studies, it followed a right hemisphere lesion in every case (one case was bilateral), and the visual field affected was, with the exception of this last case, the left (see note for details of pathology).¹¹³

A patient with left hemimicropsia following a right occipital lesion, when asked to draw a butterfly, exhibited a compensatory enlargement of the left half of the butterfly. When asked about it she was not aware of the discrepancy, because only by drawing it enlarged could she make it look – to her – the ‘normal’ size.¹¹⁴

One curious phenomenon involves distorted perception of faces only – everything else is spared. It is sometimes called prosopometamorphopsia. Most such cases involve the right hemisphere, which is not surprising since face perception is largely dependent on the right hemisphere.¹¹⁵ And in two separate case reports, following a right hemisphere infarct, the patient reported, intriguingly, that the faces of family members looked distorted, while faces of other people looked normal.¹¹⁶ Interfering with the right inferior occipital gyrus by electrical stimulation produces transient distortions in faces experimentally.¹¹⁷

Occasionally there is one-sided prosopometamorphopsia, usually a form of hemimicropsia or hemimacropsia that affects faces only (see Plates 5[a] & 5[b]). Seven separately reported cases of left-sided prosopometamorphopsia for faces only were due to right hemisphere dysfunction.¹¹⁸ One woman found that, after a right posterior stroke, ‘when she looked into a mirror ... the left half of her face’ – she meant by this the part in her left visual field – ‘looked smaller than the right’.¹¹⁹ Other objects, meanwhile, looked normal, irrespective of field. One subject with a right posterior infarction saw images that were distorted, including seeing half of people’s faces, in the left field of vision, melt away ‘like clocks in a Dali painting’ (see Plate 6[a]).¹²⁰

Four cases of right-sided prosopometamorphopsia nonetheless still involved *right-sided* pathology.¹²¹ One girl saw her family as looking older than they were; another woman saw ‘any minute asymmetry as grossly distorted’; a third found that ‘the left half of the faces of people walking on

the street in the opposite direction appeared distorted; they looked like monsters'; and a fourth case reported distortion of the left eye only, and of the eye in human faces only: 'faces resembled the paintings of Picasso'. These cases reinforce the observation that metamorphopsia, whether of the right or left side of space, is usually produced by disturbances in the right hemisphere.¹²² This is possibly because the right hemisphere takes care of reality for both 'halves' of the world, with the consequence that the manifestations may appear on either side.

Unilateral prosopometamorphopsia attributable to left, rather than right, hemisphere hypofunction has been described, to my knowledge, in only four patients to date.¹²³ But, as Luigi Trojano and colleagues write, presenting one such case:

Our proposal is consistent with both neuropsychological and neurofunctional data demonstrating a right hemispheric lateralization for face processing ... We speculated that early stages of face perception proceed in parallel in the two hemispheres and only at late stages the right hemisphere *integrates information gathered from both parts* of the stimulus to build up an unitary face representation ... ¹²⁴

This model is supported by subsequent research.¹²⁵ Infarctions or tumours of the corpus callosum resulting in prosopometamorphopsia are almost invariably in what is called the splenium, the most posterior part of the corpus callosum. They almost always produce left-sided distortions: a review of the nine published cases to date found that seven out of eight of the right-handers experienced disturbance in the left field; and the one left-hander experienced disturbance in the right field.¹²⁶

Finally, there is a single report of both metamorphopsia and Cotard's syndrome occurring together, caused by laminar necrosis, a form of cell death, in the posterior right hemisphere.¹²⁷

It is notable that, while these visual distortions following brain insults are not common, very similar visual illusions and hallucinations *are* common in patients with schizophrenia – occurring in more than a quarter of cases.¹²⁸ These include every category that Cutting found in right hemisphere damage: shape, size, three-dimensional status, distance,

permanence, emotional value, and disruptions of the sense of ‘reality’ itself. I will discuss at length in Chapter 9 the overlap between right hemisphere deficits and schizophrenia.

Below are some illustrative examples of each, taken from the accounts of subjects with schizophrenia:

- *Shape:*

‘I saw a man who suddenly had the teeth and nose of a rabbit’ ¹²⁹

‘For short periods I kept seeing things criss-cross, weirdly scrunched up to one another’ ¹³⁰

‘Houses float, walls move in on her and then drift away’ ¹³¹

‘Objects in odd proportions, street seems to tilt, walls of building closing in’ ¹³²

‘The houses were all so lopsided, they didn’t stand straight’ ¹³³

‘When I look down at the lower part of my body, it constantly feels twisted and displaced to the left, compared to the rest of the body.’ ¹³⁴

- *Size:*

‘The furniture seemed warped and small, the room long and wide’ ¹³⁵

‘People were changed – one day outsize, another all small again’ ¹³⁶

There may also be so-called Lilliputian hallucinations, a quite distinct phenomenon, in which subjects see miniature objects or persons (‘persecutor dwarfs’) either in objective space or invading the body; there have been four reports to date in schizophrenia ¹³⁷

- *Three-dimensional status:*

‘External world ... like a two-dimensional transparency’ ¹³⁸

‘She could not see except in outlines, grey against grey, and with no depth, but flatly, like a picture’ ¹³⁹

‘the flat, grey, blurred, and two-dimensional waste of her vision’ ¹⁴⁰

‘The scenery seems too still and flat, like a picture postcard. I have lost my depth perception and am consequently struggling to maintain a sense of reality. I feel that if I were to reach up and to grab the corner of my field of vision, I could tear it away from its base, as if it were a sheet of paper on a picture calendar’ ¹⁴¹

‘People are of one dimension – cardboard cut-outs’ ¹⁴²

- *Distance:*

‘I see everything as through a telescope, smaller and at a very great distance, yet not smaller in reality but more in the mind ... less related to each other and to myself as it were ... everything is far away’ ¹⁴³

‘Everything was ... so far away’ ¹⁴⁴

‘One day, for many hours, a malaise infects me. Faint spatial irregularities distort my perceptions, deepening stairs and telescoping school corridors’ ¹⁴⁵

‘My eyes seem to have trouble focussing; I can no longer make out anything except what lies directly in my path, as if the world were far away, at the end of a long grey tube’ ¹⁴⁶

- *Permanence:*

‘He experienced the sudden disappearance of his wife from his visual field. One day later the waitress suddenly disappeared from his view ... All other elements of the scenes were intact, undistorted, and normally illuminated. Even the chair in which the patient’s wife sat and the counter behind the waitress remained unchanged. Within 10–15 seconds, both subjects had reappeared as suddenly as they had disappeared’ ¹⁴⁷

- *Emotional value:*

‘I am starting to feel pretty numb about everything because I am becoming an object and objects don’t have feelings’ ¹⁴⁸

‘Flies and insects [were] like supernatural things bearing messages’ ¹⁴⁹

- *Sense of reality:*

‘During the last week, the acute attacks of unreality began again when everything appeared vast, detached, brightly lighted ... I had lost real contact with Mama. I always watched her come with joy, but she seemed unreal, artificial’ ¹⁵⁰

There are also other right hemisphere deficit illusions that are experienced in schizophrenia, such as palinopsia (‘visual trails’):

I sometimes see abstract patterns I have seen some time before. They persist for days at the same place in my visual field; when I move my head, they follow ... [in another case] Sometimes I still see things that aren’t there anymore ... They remain before my eyes for a while. It’s like a visual echo. ¹⁵¹

This is also paralleled, since it is not just a perceptual phenomenon, in the process of thinking:

When the next thought comes along the residue of the last one is still there. Vague impression of all thoughts lingering in my mind at once. Several thoughts demanding attention at the same time. My consciousness has limbs stuck in different ideas. ¹⁵²

Limbs ‘stuck in different ideas’? How amazing is that as an expression of simultaneous virtualisation and fragmentation of the lived body?

And there are many illusions of fragmentation:

‘I have to put things together in my head. If I look at my watch I see the watch, watchstrap, face, hands and so on, then I have got to put them together to get it into one piece.’¹⁵³

Prosopometamorphopsia (distortion of faces), particularly unilateral prosopometamorphopsia, is also well recognised in schizophrenia. According to Gross and Huber’s classic review of sensory disturbances in schizophrenia, the commonest visual distortions were those of the human face and form:¹⁵⁴ for example, ‘the face of my sister-in-law, normally so slender, was broad and red, and her mouth warped’.¹⁵⁵ Many of these involved just half the face: ‘the left half of my husband’s face seemed suddenly quite different, so sad and so serious, quite different from the right half – as if my husband had been divided in two.’¹⁵⁶

Six schizophrenic patients in their study also exhibited a related phenomenon: on looking in the mirror they saw their face as deformed, masklike or completely unrecognisable.¹⁵⁷ Eight others saw things twisted or on an incline: a buckling, bowing or bending.¹⁵⁸

The archives of the Bethlem Royal Hospital contain a drawing by a subject with schizophrenia which stands as a good example of lateralised prosopometamorphopsia (see Fig. 10).¹⁵⁹ The subject saw a nurse’s right eye alone horribly distorted.

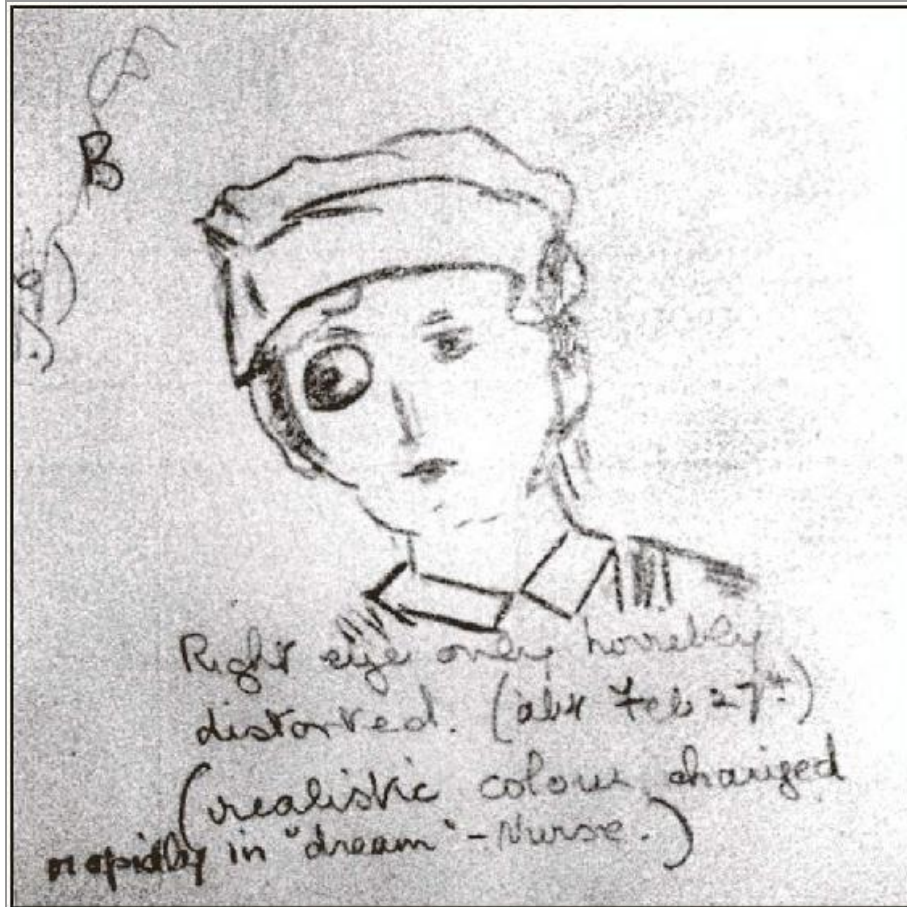


Fig. 10. 'Right eye only horribly distorted':
hemiprosopometamorphopsia (from the Bethlem Royal Hospital
archives, B3 352)

Then there is the phenomenon rather more poetically called 'Alice in Wonderland syndrome', a term which is often used rather liberally to refer to almost any combination of visual misperceptions. It should strictly involve, however, not just, or even primarily, visual disturbances, but disturbances of the perception of one's own body and the experience of time.¹⁶⁰ Accounts of the true syndrome are not common, but, as mentioned, point in almost all cases to disturbances in the right hemisphere.¹⁶¹



Fig. 11. 'Curiouser and curiouser': Alice-in-Wonderland syndrome, somatic effects (from Sir John Tenniel's illustrations to Lewis Carroll's Alice's Adventures in Wonderland, 1865)

The syndrome was first so named in the 1950s by a psychiatrist at the Littlemore Hospital in Oxford, John Todd, who reported a series of six cases. In Lewis Carroll's story, it will be remembered, Alice's body shrank after drinking from a bottle labelled DRINK ME, and became so large, after she ate a cake labelled EAT ME, that she almost touched the ceiling:

'Curiouser and curiouser!' cried Alice ... 'now I'm opening out like the largest telescope that ever was! Good-bye feet!'

However, as Todd points out, Alice was also

sometimes aware of changes of an altogether more subtle nature. Thus, there were occasions when she was conscious of some intangible change in herself and her environment. There were also times when she addressed herself as though she were two people, and others when she puzzled over her own identity ...

Alice also experienced slowing of time and motion, which, as we have already established, usually points to a right hemisphere disturbance:

Either the well was very deep, or she fell very slowly, for she had plenty of time as she went down to look about her and to wonder what was going to happen next ... Down, down, down. Would the fall never come to an end! 'I wonder how many miles I've fallen by this time?' she said aloud, 'I must be getting somewhere near the centre of the earth ...'

In *Through the Looking-Glass* there are also examples of distortions of the perception of space and time, such as being aware of the body moving fast without making progress through space – as in running with the Red Queen.



*Fig. 12. ‘In my kingdom, you have to run as fast as you can just to stay in the same place’” Alice-in-Wonderland syndrome, temporal effects (from Sir John Tenniel’s illustrations to Lewis Carroll’s *Through the Looking-Glass, and What Alice Found*, 1871)*

It is thought that Charles Dodgson, the ‘real’ Lewis Carroll, was describing, or at any rate building on, his own experiences with either migraine or temporal lobe epilepsy, each of which can give rise to metamorphopsia, as well as disturbances of time and motion perception – the essence of the Alice in Wonderland syndrome.¹⁶²

Another British psychiatrist, Stanley Coleman, had a couple of decades earlier discussed the case of a woman who would, ‘like Alice in Wonderland’, sometimes feel that she was shorter, sometimes that she was taller than she used to be.¹⁶³ This woman was developing schizophrenia, which, as the reader will recognise, is often accompanied by abnormal thoughts and experiences that are otherwise found in right hemisphere damage. And shortly before Todd’s description, the American neurologist Caro Lippman also described seven cases, including that of a middle-aged woman who suffered recurrent headaches with nausea, vomiting, and visual disturbances, presumed to be migraine. At such time she experienced

the illusion of being much taller than I actually am, in relation to ordinary objects. My head would seem far above my hands, far above table tops, etc. At other times, I seem to be ('astrally', I suppose you'd call it) detached from and above my physical body, to be able to observe it and make mental notations concerning it as a separate entity.¹⁶⁴

Here she describes, as well as elongation of the body, autoscopy. Two other patients of Lippman experienced similar elongation:

(First patient) It was at these times that I experienced the sensation that my head had grown to tremendous proportions and was so light that it floated up to the ceiling, although I was sure it was still attached to my neck. I used to try to hold it down with my hands ...

(Second patient) I get all tired out from pulling my head down from the ceiling. My head feels like a balloon; my neck stretches and my head goes to the ceiling. I've been pulling it down all night long.

Another experienced feeling 'about one foot high', while yet another patient actually referred to her experiences as 'the Tweedle-Dum or Tweedle-Dee feeling', perhaps prompted by the feeling of being, not just shorter and fatter, but in some sense twofold. Intriguingly, another reported size alterations occurring just on one side at any one time:

Today my body is as if someone had drawn a vertical line separating the two halves. The right half seems to be twice the size of the left half. I wonder how I am going to get my hat on when one side of my head is so much bigger than the other. After a few minutes of feeling large, the right half seems to shrink until it is smaller than the left. This process has been coming and going all day long ...

Neither Coleman's nor Lippman's accounts give clear indicators of laterality.¹⁶⁵ Only two of Todd's six accounts yield possibly lateralising signs, both suggesting right hemisphere pathology. One subject experienced:

transient feelings of unreality, of depersonalization, of growing small (half her real size), and of duality. The latter takes the form of an invisible alter ego: 'I become aware of an invisible double stationed a yard away on my *left*. This shadowy double seems to contain my mind.'

Another complained of:

a recurrent morbid urge to strangle herself, or anyone else who chanced to be at hand during the attacks. In addition, she was periodically conscious of illusory distortions of her body. On these occasions her head would feel three times its normal size, or her legs so shortened that her feet seemed to be attached just below her knees. Without warning, she would be overwhelmed by feelings of unreality of such intensity that she was compelled to look in a mirror to confirm her presence in the room. Sometimes her *left* arm and breast would suddenly *lose their personal significance; they no longer seemed to belong to her*. Not infrequently she noticed an illusory diminution in the size of objects or persons, which at times assumed Lilliputian proportions (micropsia). [166](#)

The loss of personal significance and sense of belonging, together with the left-sided phenomena, suggest right hemisphere pathology.

Since these early case reports, there have been, it has been claimed, as many as 100 or more further published accounts of Alice in Wonderland syndrome (or AiWS). The number very much depends on what counts as AiWS, and would be far lower if there were any degree of stringency to the criteria. In addition, many of the cases involve global infective encephalopathies, migraine or psychiatric conditions with no localising features, as well as drug reactions. I know of 15 cases in which it was possible to identify a focal abnormality: of these, 14 involved right hemisphere dysfunction (two being bilateral), and only one involved left hemisphere dysfunction alone. In my view this latter case is quite clearly not, in fact, a case of AiWS: the subject merely saw alterations of colour cast and 'scintillations'. This would be in keeping with the principle that left hemisphere involvement on its own leads usually to less dramatic

alterations in the nature of reality – hardly, in this case, alterations in reality at all (see note for details of all cases).¹⁶⁷

In three recent reviews of the literature on the syndrome, laterality is mentioned only occasionally in passing, and there was no attempt in any of them to assess differences of laterality in any systematic fashion, demonstrating rather vividly the continuing neglect of the importance of laterality in neuroscience research.¹⁶⁸

Auditory hallucinations

An analysis of a large number of previously published cases of auditory hallucinations where they were due to unilateral brain lesions shows that in almost 100% of such cases the lesions are right-sided.¹⁶⁹ This was independent of sex, age, verbal or non-verbal content of the hallucination, or any other discriminable factor. A subsequent study of 641 stroke patients found that auditory hallucinations were rare in that population, but that every single case involved damage to the right temporal lobe.¹⁷⁰ The commonest form of hallucination in psychotic patients is auditory, and most of these are found in schizophrenia and mania, conditions both of which resemble, in different respects, a left over right hemisphere imbalance.¹⁷¹

So much for the site of damage. But where do the auditory hallucinations themselves originate? Do they come from the abnormal right hemisphere? Or from the intact left hemisphere, now that it no longer has countervailing input from the right hemisphere to orientate it to reality? One possibility is that they are the left hemisphere's verbalisation of thoughts originating in the right hemisphere.¹⁷² In a study of 87 patients, a conflicting stimulus delivered to the right ear/left hemisphere interfered with auditory hallucinations, but did not when delivered to the left ear/right hemisphere, suggesting that the left auditory cortex may be the seat of auditory hallucinations.¹⁷³ In line with this, a significant increase in relative EEG power was observed in the left, but not in the right, auditory cortex during auditory hallucinations.¹⁷⁴ A meta-analysis of studies that used rTMS to suppress the left temporoparietal region revealed that this was an effective treatment for auditory hallucinations.¹⁷⁵ This all goes to suggest that the problem in right hemisphere injury is that there is no longer anything to counterbalance the left hemisphere's alienating, objectifying

tendency, nothing to orientate the subject to reality. This interpretation would be in line with the report of a man who experienced auditory hallucinations for the first time *after* right temporal lobectomy.¹⁷⁶ Even articulations of the subject's own thoughts then appear somehow alien.

There is a distinct category of auditory hallucinations known as musical hallucinations. These are not delusional in the way that auditory hallucinations are. The majority of these are due to right hemisphere lesions; one study suggests that they can originate in abnormal activity in the left hemisphere.¹⁷⁷ A review of 46 cases by German Berrios concluded that right hemisphere pathology was 'over-represented'.¹⁷⁸ Another review finds that musical hallucinations point generally to the same right hemisphere deficits.¹⁷⁹ Case reports of musical hallucinations in which an organic pathology can be localised to one hemisphere or another, reveal 12 due to right hemisphere (usually temporal lobe) pathology,¹⁸⁰ six due to a left hemisphere focus of pathology,¹⁸¹ and one due to bilateral temporal lobe pathology.¹⁸² However, a review of the Mayo Clinic's records, which unearthed 393 cases of musical hallucinations, involving either hemisphere, found no statistically significant hemisphere difference.¹⁸³

Olfactory and gustatory hallucinations

No overview of lateralisation in olfactory hallucinations has been undertaken, possibly because cases in which brain localisation is possible are rare. Studies of lateralisation of normal olfactory function favour the right orbitofrontal area, as we have seen. I can find only five reported cases of olfactory hallucination to date for which a lateralised brain lesion can be identified: four of these were in the right hemisphere (the left-sided case was female, handedness not given).¹⁸⁴

I can find only three cases of gustatory hallucinations in which lateralised pathology was identifiable. All three were due to pathology in the right temporal region.¹⁸⁵

Olfactory and gustatory hallucinations occur fairly frequently in schizophrenia, with a lifetime prevalence of between 15% and 35%.¹⁸⁶

Tactile hallucinations

Most haptic (tactile) hallucinations are drug-induced or form part of a 'non-organic' psychiatric illness, and are therefore not localisable. Where they are associated with localisable, unilateral pathology, almost all abnormalities of the sense of touch seem to follow right hemisphere damage, as a range of imaging and neuropsychological studies has shown.¹⁸⁷ I am aware of only three cases involving the left hemisphere, of which one was bilateral. All three cases were female and handedness was not given.¹⁸⁸ Haptic hallucinations are not uncommon in schizophrenia.¹⁸⁹

I am sometimes asked whether the experiences of people taking hallucinogenic drugs are due to right hemisphere 'release'. I am very doubtful of this. There is very little direct evidence, but on first principles, it seems more likely that, to the extent that lateralisation is a significant factor, they are caused by suppression of the right hemisphere. What little evidence exists supports this interpretation. In a now famous study by Serafetinides in 1965 – one that is (sadly from the purely scientific point of view) very unlikely to be repeated – subjects with either right or left temporal lobe epileptogenic foci were given LSD both before and after temporal lobectomy for their epilepsy. The hallucinations were significantly more marked in the right hemisphere-damaged subjects than in the left hemisphere-damaged subjects and *continued to be so after temporal lobectomy*; in other words they remained elevated after the right temporal lobe was actually removed.¹⁹⁰ The mean perceptual disturbance scores were 17.33 pre-operatively for right hemisphere damage (left hemisphere predominance), and were still 12.10 after removal of the right temporal lobe altogether; by contrast they were 8.18 for left hemisphere damage (right hemisphere predominance), and fell to only 2.82 (almost abolished) after removal of the left temporal lobe. This implies that hallucinations are more often due to right hemisphere than left hemisphere dysfunction.

Almost all extraordinary distortions of reality follow from right hemisphere damage. More than this, it is not just hallucinations and misperceptions, but delusions, distortions of judgment and belief, that are, as I will demonstrate in the next chapter, associated with the left hemisphere. In fact, hallucinations may themselves result from failures of judgment. We all see faces in the foliage on trees, but most of us disregard the likelihood that these are secret agents sent to spy on us. Equally, we all experience people we know as different on different occasions, but few of us conclude that they are not really human, but zombies or machines. It

seems that when the right hemisphere's guidance is lacking, we are much more likely to make both over-credulous, and over-sceptical, judgments on reality.

SUMMARY

In every sensory modality the right hemisphere appears to have an advantage over the left when it comes to primary perception. Perceptual distortions and hallucinations in each sensory modality are strongly associated with right hemisphere dysfunction. Thus, as far as both attention and perception go, the right hemisphere is a more important guide and a more reliable one to the nature of reality. This is in keeping with the roles of the hemispheres diverging over evolution, as described in Chapter 1.

JUDGMENT

Perception is a judgment, but one that is unaware of its reasons, which is as much as to say that the object perceived gives itself as a whole and as a unity before we have grasped its intelligible principle.

—*Maurice Merleau-Ponty*¹

WE WILL BE LOOKING AT THE ROLES OF THE TWO HEMISPHERES IN THE normal process of reaching beliefs and making judgments throughout Part II, since such an examination is fundamental to our aim of knowing when we are more, or less, likely to be deceiving ourselves. Here, then, I will concern myself with what happens when the process itself has clearly gone awry: when we are prey to delusions.

We have seen that most hallucinations are due to right hemisphere damage or dysfunction. What the research literature to date suggests is that nearly all delusions, as well – in particular the more extravagant ones – are due to right hemisphere damage or dysfunction.² Distinguishing delusions (distorted reality judgments) from hallucinations (distorted perceptions) is to some degree arbitrary, since misperceptions can give rise to misbeliefs, and misbeliefs give rise to misperceptions. Added to which, all perceptions involve a judgment undertaken before we are aware of it. We don't see a shape, a texture, a bunch of colours, and only then deduce 'a tree'. We see the tree whole and immediately, because somewhere way below

consciousness we are discriminating what fits best in the context in which we find ourselves.

I will therefore look at the various syndromes that follow as they span abnormal perception, abnormal belief and abnormal judgment, before moving on to what are more clearly matters of judgment alone. Our categories are sharp; life is blunt.

HEMISPHERIC DIFFERENCES IN PATHOLOGIES OF JUDGMENT

What we find in this chapter is that, if the left hemisphere is not frankly deluded, it is clearly at sea, and the right hemisphere is its reliable anchor in reality. I'll wager that is not what you have heard to date – so does that sound a bit extreme? Let's take a look.

A review by Andrew Young in 2000 found that 'diverse though they may be, delusional beliefs tend to follow brain injury affecting the right cerebral hemisphere ... every delusion discussed so far [in his review] has been shown to be more frequent after right- than after left- sided brain damage'.³

People with right hemisphere strokes may develop schizophrenic-like delusions as a result of their lesions. A comprehensive search of the literature to 2018 revealed 106 cases of such delusions following right hemisphere stroke (though at least two, perhaps three, cases that would appear to have met criteria may have been overlooked – see notes).⁴ Of these 106, only 19 occurred after left hemisphere stroke. Psychosis may be precipitated by right brain injury or by surgery, especially after heart surgery, possibly because this may compromise blood flow to the right hemisphere.⁵

It does seem that there is something intrinsically prone to delusion about the left hemisphere. Nikki Marinsek and colleagues, including Mike Gazzaniga, in another paper write: 'Delusions may ... arise when the left hemisphere's tendency to explain goes awry; indeed, delusional disorders are characterized by excessive inference making and the tendency to prematurely jump to conclusions.'⁶ And Orrin Devinsky:

The unchecked left hemisphere unleashes a creative narrator from the monitoring of self, memory, and reality by the frontal and right hemisphere areas, leading to excessive and false explanations. Further, the left hemisphere's cognitive style of categorization, often into dual categories, leads it to invent a duplicate or impostor to resolve conflicting information. Delusions result from right hemisphere lesions. But it is the *left hemisphere that is deluded*.⁷

One of the reasons schizophrenics are deluded is their tendency to jump to conclusions without weighing up overall whether these conclusions are probable.⁸ This is thought to be because of a need for closure – a tendency to prefer an answer, irrespective of its plausibility, to ambiguity and uncertainty.⁹ This is a tendency that is also reflected in the culture of modernity: it encourages us all to rush for closure. When told that there are 125 sheep and five dogs in a flock, and then asked ‘How old is the shepherd?’, three out of four schoolchildren will produce a numerical answer, rather than reply that ‘there is not enough information’.¹⁰

If you combine this need for closure, exaggerated in schizophrenia and the isolated left hemisphere, with the paucity of reliable experience available in the absence of a properly functioning right hemisphere, the picture becomes understandable. In an interesting paper on the nature of delusion, Braun & Suffren posit a model

not so much based on perceptual or cognitive deficits after right hemisphere damage as on cognitive propensities, specifically excessive inferencing (especially jumping to conclusions) and excessive reference to the self, due to left hemisphere overactivity.

Their conclusion is that ‘most cases of delusion’ are due to left hemisphere overactivity combined with right hemisphere underactivity.¹¹ Since the relationship between the hemispheres is a dynamic one of reciprocal inhibition, it is in a sense irrelevant whether what happens is that the right hemisphere is underactive, or the left hemisphere is overactive, since the effect in either case is the same: once the reality-testing, reality-congruent, right hemisphere is overwhelmed, there is nothing to stop the left hemisphere going off on one. Delusions have consistently been linked to *either* right hemisphere dysfunction *or* left hemisphere overactivity (or both).¹² When the left hemisphere has to depend on its partial understanding of the world, it may ‘create explanations that are incorrect, inappropriate, or even bizarre’.¹³

What happens is not that reality is primarily shaped by the left hemisphere, albeit in delinquent fashion, and that this is then knocked into a realistic shape by the thought police of the right hemisphere, but that reality is primarily shaped by the right hemisphere. So when the right hemisphere

is malfunctioning, the left hemisphere is relatively at a loss. In the normal state of affairs, the world is construed realistically by the right hemisphere, and a highly stylised version of it is then taken up and worked with by the left hemisphere in ways that may or may not bear much relation to reality, from which it is always operating at a remove. This remove is OK up to a point, provided the left hemisphere is properly tethered to the right hemisphere. The problem comes with right hemisphere damage, when there is no countervailing balance – and then the result is, indeed, pandemonium.

I mentioned that Braun & Suffren ¹⁴ found that, where delusional disorder was associated with a unilateral cerebral lesion, in 73% cases it was in the right hemisphere. This is in accord with the findings in many other studies suggesting that neurological patients with delusions commonly have lesions in the right hemisphere alone, or both hemispheres, rarely just in the left hemisphere.¹⁵ Psychosis is common after removing the right temporal lobe, more rarely after removing the left.¹⁶ Right hemisphere damage much more commonly leads to psychotic phenomena than left hemisphere damage (approximately 6:1).¹⁷ Delusions in Alzheimer's disease have repeatedly been shown to be associated with hypofunction of the anterior right, rather than left, hemisphere.¹⁸ The right dorsolateral prefrontal cortex (malfunctioning in schizophrenia) is the most important part of the brain for testing our theories against experience.¹⁹ Max Coltheart, the author of a number of important more recent papers on the area, draws attention to the fact that 'the region of the brain specifically involved in hypothesis evaluation ... is the right lateral prefrontal cortex', and that delusions occur when it is not fully operative.²⁰

This is not really surprising if one just thinks about the phenomenology. The main features of delusions – poor reality testing, incorrigibility, and unwarranted subjective certainty²¹ – are all features of the left hemisphere's world. Indeed, one way of seeing the variable ratio of right to left damage in delusions is to look at the extreme nature, and the incorrigibility, of the delusion. The more extreme, and the more incorrigible, the delusion, the more likely it is to be due to right hemisphere dysfunction and a free-wheeling left hemisphere. Thus, for example, anosognosia (denial of a deficit) is most commonly due to right hemisphere damage, but somatoparaphrenia (thinking that bits of your body don't even belong to you) is almost always so.

Neglect

We are already familiar with this phenomenon, which involves judgment. Damage to the right parietal lobe often results in a patient's losing the left half of space. Though damage to the left parietal lobe can, infrequently, produce something like this deficit in the right half of space, when it does so, the impairment is much less marked and more transient,²² and 'the vast majority of patients with spatial neglect suffer from right hemisphere damage.'²³ To put that assertion in context, in a series of 59 patients with hemineglect assembled by Henri Hécaen, 55 had right-sided lesions; of the four with left hemisphere lesions, three were left-handed.²⁴ In a further series of 57 patients reported by Hécaen, 56 had right hemisphere lesions.²⁵ Hécaen – one of the most revered names in the history of neuropsychology – could be mistaken, but probably not by any amount that is going to change the view that this phenomenon is highly characteristic of damage to the right hemisphere, not the left.

Anosognosia, asomatognosia, somatoparaphrenia, and anosodiaphoria

I can pass over these here, because you have heard enough about them in the previous chapters, and we have already established that the first (denial of a deficit) most commonly is, and the last three (failure to recognise body parts, attribution of a body part to another person, and incongruous indifference to a deficit) almost invariably are, associated with right hemisphere deficits.

It has been suggested that the strength of the association of anosognosia with right hemisphere damage might be artificially inflated by the fact that after left hemisphere stroke many patients are aphasic, and therefore not articulate enough to deny their paralysis, unlike right hemisphere stroke patients. This was addressed by a study in which eight normal subjects had one hemisphere at a time knocked out by an injection of sodium amytal into the carotid artery. In each case, the subject developed a contralateral hemiplegia – a weakness or paralysis on the other side of the body – within five seconds. Afterwards, all eight recalled the right-sided hemiplegia; not one recalled the left. In other words, with the left hemisphere knocked out

they were fully aware of the contralateral deficit; with the right hemisphere knocked out, they were completely oblivious of it.²⁶

Prosopagnosia

Prosopagnosia (inability to recognise faces) almost always implies damage to the right hemisphere, especially the right temporal lobe.²⁷ A review paper by Hécaen & Angelergues presented four cases of prosopagnosia, all with right hemisphere disturbances, and reviewed a series of 22 additional cases, of which 20 involved the right hemisphere (one of those that involved the left hemisphere was left-handed).²⁸ Subsequently Landis and colleagues presented six new cases, all with only right-sided lesions; and reviewed the literature, concluding in favour of the view that a right hemisphere lesion alone is enough to produce prosopagnosia.²⁹ Transient prosopagnosia can be induced in normal subjects simply by disrupting the function of the right anterior fusiform gyrus.³⁰ The left temporal lobe is involved in putting a *name* to a face; but by contrast the recognition of the face as a face, as familiar, and as a particular person, as well as the understanding of its expression – all that is dependent on the right hemisphere.³¹

In a study examining responses to faces presented in one visual field at a time, identifying a face in the right visual field may be associated with activity in the left fusiform area, but only when the face has previously been processed by the right hemisphere, not when it has been processed only by the left: ‘these results imply that facial identity information is transferred from the right hemisphere to the left hemisphere.’³² Incidentally this underscores the value of lesion studies and callosotomy studies, since, in studies of the intact brain, information is being ‘promiscuously’ shared, in a way that makes differentiation more difficult.

In general this ‘quintessential example of hemispheric specialization’, as the researchers put it, was bound to be the case, if only because of the manifest superiority of the right hemisphere at understanding complex wholes, rather than cataloguing a few outstanding features – a mole, a parting, a big nose, and so on.³³ An exhaustive literature review on abnormalities of person recognition demonstrates the crucial role of right hemisphere regions, especially temporal, but also parietal, occipital and

frontal, for person recognition *in any modality* – by face, by voice and so on. Once again, please note that the effect can occur with dysfunction in a wide variety of locations, but almost always within the right hemisphere. Too narrow a concern with one region only may obscure a highly robust hemisphere difference, unless analysis takes this into account. Only recognition of personal names was clearly left hemisphere-dependent. ³⁴

Delusional misidentification

This category of delusions, including Capgras and Fregoli syndromes, and reduplicative paramnesia, we have also looked at before. In organic cases of disorders of misidentification it seems that it is almost always due to right hemisphere damage.³⁵ Out of 20 cases reviewed by Hans Förstl and colleagues, in which delusional misidentification accompanied a focal lesion, 19 were right-sided.³⁶ In 41 cases listed by Burgess *et al*, where there was known neurological pathology, only three had no detectable neurological deficit in the right hemisphere, and two of those were cases of confabulation alone (no data on handedness given).³⁷ And in cases where there was no manifest brain damage as such, cases of delusional misidentification showed, nonetheless, right hemisphere deficits on scanning or neuropsychological testing.³⁸ In the words of one review of the subject: ‘It can be seen that the right hemisphere or bilateral lesions were invariably found on neuroimaging, with no exclusively left hemisphere lesions.’³⁹ The most recent comprehensive review of 61 case reports found right hemisphere lesions in 92% of cases.⁴⁰

Lycanthropy, believing one is turned into a wolf, is a rare form of self-misidentification and appears to be associated, where a brain lesion can be identified, only with right hemisphere lesions.⁴¹ This is in keeping with other evidence that all forms of delusional self-misidentification are dependent on right hemisphere deficits.⁴² It also overlaps with Cotard’s syndrome (another right hemisphere deficit syndrome – see below).⁴³

Paranoia

Right hemisphere dysfunction causes a paranoid psychosis as commonly as it does delusional misidentification.⁴⁴ Paranoia is a general term, which in conventional psychiatric classification strictly implies mistaken reference to self ('the police are communicating with me through the TV'), including grandiose and religious delusions (eg, 'I am the head of MI5/Jesus Christ'); but it is usually taken to mean, in accordance with popular usage, undue suspiciousness, rather than grandiosity (which by the way is associated with left hemisphere overdrive, as in mania). Paranoia is a common feature of mental illness, though the qualification 'mental' could be misleading if it seemed to suggest that such illness is not also, inevitably, a brain disorder. Paranoia is especially common, of course, in schizophrenia which, as I have suggested, in many ways resembles a right hemisphere deficit disorder. In four series of cases of paranoia following cerebral insult, and three case reports, totalling in all 35 cases, every single one involved right-sided lesions.⁴⁵ Cases of Alzheimer's type dementia with paranoid delusions had significantly greater losses of volume in the right hemisphere.⁴⁶ And increased perfusion, a proxy for increased activity, of the left temporal lobe may be associated with an increase in suspiciousness.⁴⁷

Such delusions can coexist with otherwise normal critical faculties. I remember a lovely man, a dignified old-fashioned gentleman with a white moustache, always very well-turned out and apparently well able to care for himself, who told me he was distressed because, since a minor right hemisphere stroke, the police had rented the flat next to his and were broadcasting slander about him. In their latest escapade, he told me, they had turned the speakers to the party wall and were sending him messages direct. Why had they done this? I asked. He replied that he had no idea why they were doing it, but that their suggestions had got quite out of hand. What were they saying? 'Doctor, the things they're telling me to do are not only in themselves quite repulsive, but' – here his voice took on a note of sheer incredulity – 'they're *physically impossible*.'

Othello syndrome

This is the name given to one type of paranoid syndrome, delusional jealousy. Those affected become unreasonably convinced that their partner

has been untrue to them. This often results in tyrannical behaviour – never allowing the partner out of one’s sight, secretly monitoring messages, etc. It is not infrequently caused by alcoholism, and can be a dangerous condition for those who find themselves its target. However, alcoholism or no alcoholism, this paranoid psychosis, like others, is almost always consequent on a right hemisphere, particularly right frontal, lesion.⁴⁸ One prospective study found that no delusional thinking of any kind was present in any of 170 patients with left hemisphere stroke, whereas 15 of 190 patients with right hemisphere stroke were deluded; 20% of these had delusional jealousy.⁴⁹ One case report is suggestive of left frontotemporal pathology but unfortunately does not specify handedness.⁵⁰

And indeed jealousy in general is strongly related to right hemisphere damage.⁵¹ This is consonant with the relatively poor performance of the unaided left hemisphere in understanding emotion, mental state reasoning, making moral judgments, and reading body language, quite apart from its role in generating false beliefs and delusions. Fascinatingly, however, this lateralisation would seem to be already present in infants: infants whose left hemisphere was more active than their right hemisphere on EEG exhibited significantly more jealous behaviour than other infants.⁵²

de Clérambault’s syndrome (erotomania)

This syndrome refers to a delusional belief that someone of high status is in love with you – and has taken the initiative in the romance (the usual left hemisphere’s ‘nothing to do with me, guv’).⁵³ Common targets are celebrities, politicians and royalty. Again it can be dangerous for its targets, who may find themselves being stalked: it’s the *Play Misty for Me* phenomenon. In a reported series of five individuals where erotomania was associated with brain damage, the damage was in every case right-sided.⁵⁴ Another woman with multi-infarct dementia believed that the Prince of Wales had proposed marriage, and that she had already been married to, and separated from, the former Israeli Prime Minister Shimon Peres. There were several findings on CT scan but the principal one was a right parieto-occipital infarct.⁵⁵ However, a man with erotomaniac delusions, who had no clear brain lesion, showed left hemisphere slowing on EEG, and one of two cases reported by Martin Brüne and Stefan Schröder showed generalised

white matter lesions, most prominent in the left internal capsule, the other showing a focus in the right hemisphere.⁵⁶

Mirror agnosia

Then there is the mirrored self delusion, where the subject cannot recognise himself in a looking glass: almost all have right hemisphere or bilateral impairment. In a review of 42 cases where organic brain lesions had been identified, 41 involved the right hemisphere, though 32 of these were bilateral; eight had right-sided focal lesions alone, and just one had a left-sided focal lesion (unfortunately handedness is not recorded).⁵⁷ Other cases support a right hemisphere deficit syndrome.⁵⁸ The right dorsolateral prefrontal cortex, parieto-frontal and insular regions seem to have a crucial role in self-recognition,⁵⁹ including recognising one's own voice.⁶⁰

Cotard's delusion

This is a very curious delusion, named after the nineteenth-century French neurologist, Jules Cotard, who was (there is no justice in the history of medicine) the fifth person to describe it, although he gave the first detailed account.⁶¹ In this condition, patients believe themselves to be already dead, and sometimes demand to be buried. A patient I once looked after with Cotard syndrome agreed to my request to take blood, but assured me that I would be disappointed, because there was none in her body, which, she claimed, was already putrefying. As I took her blood, I showed her the syringe: 'There', I said, hoping to reassure her, and perhaps a little triumphantly, 'there's still blood in your arm.' She looked at me absolutely unfazed, and replied, witheringly: 'You put it there'. In those cases where a lesion has been traced, a right hemisphere lesion, usually affecting the temporoparietal area, has been reported in almost every case.⁶²

Is it a coincidence that the left hemisphere has an affinity with all that is lifeless or mechanical? Some subjects with Cotard's syndrome have been known to cut their wrists to prove they have no blood in them.⁶³ The behaviour is reminiscent of schizophrenic patients who believe themselves to be machines, and are known to cut their wrists to see if there is engine oil in them.⁶⁴ The syndrome often overlaps with Capgras syndrome, which is

also strongly dependent on damage to the right hemisphere: one man believed his stepfather was a cleverly disguised robot, and chopped his head off with a chainsaw looking for the batteries and microchips within (see note for other cases).⁶⁵

Some can be florid. A far from typical case involved a 39 year-old Iranian man who believed not only that he was dead, but that he had been turned into a dog – as had his wife. His daughters had been turned into sheep: he could smell his daughters’ ovine urine in the hospital. People were poisoning his tea, but since he was dead this had proved ineffective. Alas, no investigations of the brain were undertaken.⁶⁶ This case shows signs of lycanthropy (see above).

Delusions of infestation

These are what they say they are. They are often delusional interpretations of bodily sensations such as itching or crawling of the skin, though the sensations themselves are usually hallucinatory. They are strongly associated with right hemisphere lesions;⁶⁷ and tactile hallucinations, specifically, are associated, as we have seen, with right hemisphere damage.

Response-to-next-patient syndrome

This is a fascinating syndrome that, while strictly speaking not delusional, demonstrates an aberrant understanding of the world based on left hemisphere attention.⁶⁸ It was first described by Bogousslavsky and Regli: during the period they surveyed, 439 stroke patients were admitted to hospital, 134 with right hemisphere stroke, 198 with left hemisphere stroke and 107 with ‘infratentorial’ stroke (ie, involving the lower part of the brain, below the level of the hemispheres). They found that 8% of the right hemisphere stroke patients – but not one of the left hemisphere or infratentorial stroke patients – carried out actions or answered questions which were addressed to the *patient in the next bed*, even when they had just been through the same actions and questions in their own case; when asked why, they couldn’t explain. The phenomenon was associated with other common right hemisphere stroke sequelae, such as denial and neglect.

The authors describe it as ‘stuck-in-set’ behaviour, which seems reasonable.⁶⁹ Another way of looking at it is, however, that what should be specific to me has become *generalised*.

ALTERED ROLE OF THE BODY

I mentioned that the right hemisphere supports the body schema. One of the most fascinating aspects of this is that an intact body schema is innate, even in those whose body from birth was abnormal. Phantom limb sensations are reported by children who were *born* without one or more limbs.⁷⁰

And it is the body schema that is aberrant in anorexia nervosa, so much so that a person who is in reality grossly underweight, and may be starving to death, sees herself as grotesquely obese. Although not usually classified as a psychotic illness, it is delusional, and other psychotic symptoms are not uncommon; anorexia can also occur in the prodrome of schizophrenia.⁷¹ Schizophrenia and anorexia nervosa are in fact genetically linked, and each is commoner in genetic lineages of the other.⁷²

Quite apart from the clue given by the fact that the body schema lies in the right parietal cortex, in cases where anorexia was associated with a hemispheric lesion, the majority were right-sided; imaging and EEG studies of anorexia nervosa show hypofunction of the right hemisphere; psychological profiles of subjects with anorexia show typical right hemisphere deficits; and in one case a left-sided stroke caused the sudden remission of a patient whose life for years had been dominated by anorexia nervosa.⁷³ A study of eating disorders in dementia showed that they were associated with atrophy in the right, but not left, frontal cortex, anterior cingulate cortex, caudate head and insula.⁷⁴

It makes sense, then, that when changes in the brain lead to changes in bodily appetites, it is usually right-sided. Leaving aside anorexia nervosa, which is much more complex than any simple disorder of appetite, if it can be considered one at all, disorders of appetite have an association with right hemisphere lesions.⁷⁵ Tumours in the right hemisphere are twice as likely to induce profound loss of appetite as those in the left.⁷⁶ Or the reverse phenomenon: Denis Williams describes in detail a case of a young woman who developed a habit of eating 8-inch wax candles after developing a right temporal tumour.⁷⁷ We reported a case of a man who started to both eat and sleep excessively after a right-sided infarct of the thalamus (he also developed a range of other right hemisphere deficit signs, including visuo-

spatial deficits, fatuous affect, inappropriate elation and irritability, and at times paranoid delusions).⁷⁸

There is also something called ‘gourmand’ syndrome, in which there is an out of character preoccupation with food and, often, a strong preference for fine eating, after the onset of a cerebral lesion. Such patients persistently crave fine food despite having apparently normal sensations of hunger and fullness. Of 36 patients reported in the largest review of the syndrome, 34 had lesions in the right hemisphere, in frontal lobe, basal ganglia, or limbic areas.⁷⁹ Many of these ‘gourmand’ patients, unsurprisingly, develop other behavioural changes typical of right frontal damage: they become disinhibited, talk excessively, become more aggressive and impulsive (in fact, food craving may be just an aspect of this wider problem), and lack emotional control. Any likeness to well-known food journalists is entirely co-incidental.

Autoscopy and heautoscopy

Autoscopy is seeing yourself from outside your own body, usually floating above it. The consensus is that autoscopic hallucinations and, especially, out of body experiences, most commonly involve disturbance of the right temporoparietal or right parieto-occipital junctions.⁸⁰ A related condition, conventionally referred to as heautoscopy, in which the subject confronts a copy of himself at a distance (thought by some to be the origin of the concept of the *Doppelgänger*, though this is a technically different phenomenon) frequently involves the left temporoparietal junction; although according to the most extensive review of the literature to date, heautoscopy shows no hemispheric bias.⁸¹ The tendency for autoscopy to depend on right hemisphere lesions, however, remains robust.

Phantom limb

Here we are not talking about the phantom limb experienced by a person who has had a limb amputated, but the spontaneous generation of a phantom extra limb or limbs following brain injury. Of all reported cases in which lateralised pathology was determined, all but two involved the right hemisphere.

There are a number of early case reports. In 1930 Hans Ehrenwald described a patient who, following a right hemisphere stroke with left hemiplegia, said that he had a ‘nestful’ of hands in his bed.⁸² In 1954, Weinstein and colleagues reviewed a number of other cases from the ’20s and ’30s: a man with a left hemiplegia who, for several months, expressed the belief that he had two left hands, three heads and six feet; a patient who claimed he had two left ears; another with a left hemiplegia who maintained he had two left hands; and a detailed study of six cases of duplication of body parts in patients having left hemiplegia.⁸³ They also reported four cases of their own: a woman with a left-sided paralysis who had an extra hand and part of an arm on the left side; a soldier with left-sided weakness, who had an extra pair of legs coming off sideways at his hips; a young man with left-sided signs (and requiring drainage of the right lateral ventricle), who had between three and six heads at different times, and up to five bodies; and a fourth case, with bilateral brain damage and a right hemiplegia, who had four eyes, two heads, two bodies, four arms and four legs. Hécaen and Ajuriaguerra reported four further cases from the literature and two of their own: two were due to right hemisphere pathology, one due to left, and three are unspecified.⁸⁴ More recently four subjects have been reported having developed an extra arm: one after right basal ganglia stroke,⁸⁵ one after right frontomesial stroke,⁸⁶ one after right thalamocapsular stroke,⁸⁷ and one after a right middle cerebral artery haemorrhage.⁸⁸ One patient reported three hands, and sometimes three legs, after a lesion involving the right frontal lobe and the corpus callosum.⁸⁹ Another reported up to five extra arms after a right hemisphere stroke involving both the basal ganglia and the right temporoparietal cortex;⁹⁰ and another had at times up to six supernumerary phantom limbs after a right middle cerebral artery infarct: ‘the patient’s adamant and delusional conviction of their reality caused him considerable distress’.⁹¹ Following a right hemisphere stroke, the painter Otto Dix twice painted a hand with six fingers.

There is one case reported of an extra arm after left pontine haemorrhage.⁹²

Misoplegia

Misoplegia is not a delusion, strictly speaking, though ‘frankly psychotic types of thinking and behaviour may develop’.⁹³ It is a curious state of affairs in which the subject takes against a body part, and vilifies it verbally, hits it and harms it, and generally is not willing to be its friend. This happens most usually after right hemisphere damage, often to the inferior parietal lobule, and is part of the general hollowing out and loss of emotional depth that is associated with such damage, as well as the left hemisphere’s distaste for everything to do with the body (in addition to all we know about the relative distance from embodiment in the left hemisphere compared with the right, we know that disgust in various modalities – ie, from different senses – is associated with the left insula).⁹⁴ Sometimes, in right hemisphere damage, disgust can be targeted at an object simply because it lies in the left visual field.⁹⁵

Misoplegia is usually directed against a left-sided limb.⁹⁶ We might think ‘well, it is understandable that one gets upset with a limb that is literally not pulling its weight’. But this doesn’t seem to happen often against a right-sided limb, and the phenomenon does not, in any case, lie within the bounds of rationality. For example, although the term ‘misoplegia’ (literally, ‘hatred of a stroke’) suggests at least a degree of paralysis in the targeted limb, there is a fascinating case study that involves a limb that was doing a fine job – apart from being on the left side of the body, that is.⁹⁷ This involved a 79 year-old woman with a somewhat shorter left leg since childhood, who had all her life been fully mobile and active in sports that she enjoyed. Suddenly she started to curse and swear at the left leg and call it her enemy, though apparently it was functioning normally: there was an ‘absence, in our patient, of hemiplegia, or even of any marked sensory or motor impairments’. A few weeks after this started she was admitted to hospital with a right hemisphere tumour.

Initially, she just hit the leg and wished it were dead. After a while she took up alternately caressing and beating it. After the operation, signs of anosognosia were observed. For instance, despite the fact that, following the operation, she was confined to a wheelchair, she claimed that she could run.

Xenomelia

Most peculiar of all is a related condition: xenomelia (also known as dysmelia or apotemnophilia), in which the subject fervently seeks amputation of a perfectly healthy limb. It is associated with right hemisphere (usually parietal) disorders, and the target is usually a left-sided limb: ‘the predominantly right-sided cortical abnormalities are in line with a strong bias for left-sided limbs as the target of the amputation desire.’⁹⁸ Even when the target is a right-sided limb, however, the pathology is in the right hemisphere. Nonetheless, one case, which is not strictly xenomelia, but similar to it, involved a young man with a left temporoparietal injury who nonetheless requested surgery to remove his left, normally functioning, eye.⁹⁹

Koro and dhat

Koro is a ‘culture-bound’ syndrome, found principally in the Far East, but also sometimes in Africa and Europe, in which in men there is an irrational and overwhelming belief that their genitalia are retracting and will disappear, often coupled with an intense fear that death will occur once the retraction is complete. It has something in common with the syndrome known as *dhat*, a condition reportedly seen only in India, in which the belief that semen is being discharged in the urine is coupled with a religiously based belief that a vital life fluid is being drained from the body. Both overlap to some extent with Cotard’s syndrome, in that all three express a sense of devitalisation. The only evidence about lateralisation to date depends on two studies relating to *koro*, suggesting a possible connexion with right hemisphere dysfunction.¹⁰⁰ There is no suggestion that either *koro* or *dhat* could be related to left hemisphere dysfunction. But the evidence is clearly too scanty to permit any firm conclusions to be drawn.

PESSIMISM, OPTIMISM AND REALISM

The commonest causes of delusions over all are the illnesses of bipolar disorder (formerly, manic-depressive psychosis) and schizophrenia. I have so far left them to one side because they are not usually (though either can be) the result of overt brain lesions whose lateralisation can be assessed. However, the distinction between ‘functional’ psychoses, which were once thought not to involve significant brain abnormalities, and ‘organic’ psychoses, which clearly do, is misleading if taken literally. In Chapter 9 I will examine further the extent to which schizophrenia appears to involve right hemisphere dysfunction.

Insight into illness

On the topic of insight – awareness of one’s illness – if you have come to suspect that this was not the left hemisphere’s strong suit, you would be right. Such lack of insight is after all a form of anosognosia (denial of illness). Insight is very largely right hemisphere-dependent.¹⁰¹ Insight increases when right frontal and parietal lobe function improves, and deteriorates when it deteriorates.¹⁰² I found that a personnel officer with right frontal deficits had no insight into his incapacity to carry out his former work; but when asked what he would advise a colleague in his position to do, he readily agreed that such a person should not be at work. Such ‘third person’ scenarios are often successful where there is no insight into the self.¹⁰³

Although relatively speaking the right hemisphere takes a more pessimistic view of the self, it is also more realistic about it.¹⁰⁴ After all, it is the one with insight. There is a large literature on this topic, in which there are different views, but a fair summary is that depression has repeatedly been shown to be associated with greater realism – provided the depression is not too severe. A degree of depression increases insight into illness, which makes sense, since it is associated with relative dominance of the right frontal cortex. Even subjects with schizophrenia show insight into their illness proportionate to their depressive symptoms.¹⁰⁵ The evidence is

that this is not because insight makes you depressed, but because, up to a point, being depressed gives you insight.¹⁰⁶

In understanding one's role in bringing about a certain outcome, depressives are more 'in touch' with reality even than normal subjects: depressive subjects were remarkably accurate, whereas normal subjects overestimated their role in bringing about wished for results, and underestimated their role in bringing about unwished for results.¹⁰⁷ This must apply, however, to milder degrees of depression only, since one of the aspects of psychotic depression is the adoption of responsibility for events with which one has had nothing to do.

One might think that, if one of the consequences of right hemisphere stroke is that one is unwarrantedly optimistic, one of the consequences of left hemisphere stroke might be unwarranted pessimism, or even depression. However, the relationship between the right hemisphere and depression is complex: the evidence is that depression can be caused by either a *left frontal* dysfunction or a *right posterior* dysfunction.¹⁰⁸ As explained, the frontal cortex of either hemisphere is in a reciprocal equilibrium with the opposite frontal cortex, and also with its own posterior cortex; thus either left frontal dysfunction or right posterior dysfunction leads to a prepotency of the right frontal cortex. Although an early and influential study suggested that depression was globally commoner after left hemisphere stroke than after right hemisphere stroke,¹⁰⁹ the emerging picture from more recent research does not support this. A meta-analysis published in *The Lancet* in 2000 found that when data from 34 primary studies were pooled, lesion location was not associated with depression, though there was a relatively weak association with left frontal stroke, which is in keeping with a common sense view, since it is commonly associated with losing speech and use of the right hand, whereas right hemisphere stroke is associated with loss of insight into one's deficits.¹¹⁰ A systematic review of the literature in 2004 found no overall difference;¹¹¹ a more recent (2013) comparison of depression rates in left hemisphere and right hemisphere stroke also found no difference;¹¹² and the most recent and extensive systematic review (2015) of the literature 'offered no support for the hypothesis that lesion of the left hemisphere was associated with an increased risk of depression after stroke'. Indeed it found, rather counterintuitively, an association between *right* hemisphere stroke and

depression in the subacute post-stroke phase.¹¹³ A systematic review of apathy following stroke found no difference between the hemispheres, either.¹¹⁴ A Korean retrospective review of 226 sets of case notes did find that depression was less common after right hemisphere stroke, a finding which they attributed to the high level of anosognosia (unawareness of one's deficits). They concluded, however: 'the association between the site of the stroke lesion and the likelihood of the development of depression remains controversial'.¹¹⁵ The conclusion would appear to be that there is no straightforward relationship between laterality of stroke and developing depression.¹¹⁶

Clearly, there is a kind and degree of depression in which realism is lost. In this state it is often not so much negative affect that is encountered as loss of affect altogether. This, too,

appears to be associated with *right*, not left, hemisphere *deficits*. The greatest difference, both quantitatively and in terms of statistical significance, when comparing psychotic with non-psychotic depressed patients, was that those with psychotic symptoms showed marked *hypoperfusion* in the right inferior frontal cortex, with the focus being in the insula.¹¹⁷ Equally, subjects with psychotic depression may show *reduced* electrophysiological activity in the right frontal area.¹¹⁸ We know from everything else we have looked at that this region of the right hemisphere is of central importance for reality testing.

Both depression and time perception are right hemisphere mediated. One interesting aspect of depressive realism is that mild depression makes people better at judging the duration of time.¹¹⁹ Psychotic depression, however, clearly impairs accuracy of time perception, which seems to pass very slowly.

The right hemisphere is more in touch with how it stands in relation to the world at large, less grandiose, more self-aware, than the left hemisphere.¹²⁰ The left hemisphere, as you may well be able to predict by now, has higher self-esteem than the right.¹²¹ It is unreasonably optimistic, and it lacks insight into its own limitations.¹²² The left hemisphere latches onto positive information and shifts one's attention towards it, ignoring real

risks.¹²³ One of the more interesting aspects of this phenomenon has, once again, to do with the left hemisphere's deviant sense of responsibility. In an experiment designed to test how the left hemisphere interprets causation, information fed to the left hemisphere resulted in individuals attributing 'their successes to internal, stable and global causes, while failures were blamed on external, unstable and specific causes'.¹²⁴ In simple terms, it takes the kudos when things go well, and denies responsibility when they do not.

Right frontal damage, especially in the region of the inferior frontal gyrus, can cause fatuous optimism.¹²⁵ Using transcranial magnetic stimulation to *suppress* the right inferior frontal gyrus caused healthy participants to become abnormally optimistic about what would happen in the future, compared with their normal state.¹²⁶ In keeping with this, *facilitating* the right hemisphere reduced unreasonable optimism.¹²⁷

In a rather nice piece of research, neurologists have established a connexion between the 'smiley' emoticon and right frontal failure. The subject is asked to copy, or draw from memory, the Rey-Osterrieth figure (a standard test of visuo-spatial function, memory and attention).

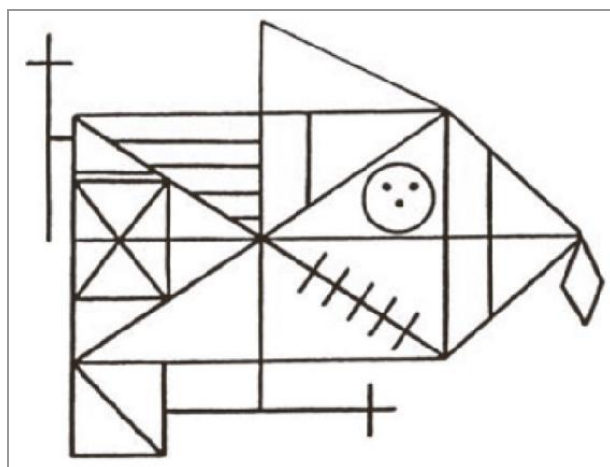


Fig. 13. The Rey-Osterrieth figure

A neurological team noticed that a woman with a right frontal tumour, who was, in line with expectation, slightly manic, had a normal neuropsychological profile apart from the fact that she converted the element which consists of a circle containing three dots into a 'smiley' face,

‘like the fashion logo’ (in 1994 the smiley had not yet entered into daily messages):

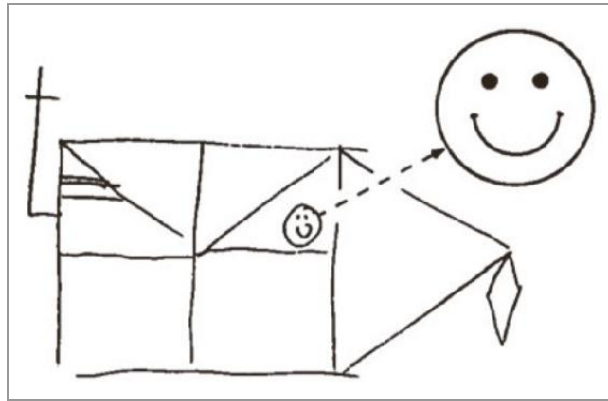


Fig. 14. The ‘smiley’ sign in right anterior dysfunction (from Regard & Landis 1994)

They then had the idea of studying all the patients who, on recalling the figure, produced a ‘smiley’, to see if there was an increased likelihood of damage to the right hemisphere. Only very few, 37 out of the 2,400 patients referred for impaired cerebral function, produced a ‘smiley’ – about 1.5%, so it was definitely not a common perceptual error. But a highly significant number of those who did, had right hemisphere lesions, particularly in the right frontal region. No depressed patient produced a face with a downturned mouth, only a ‘smiley’ was ever produced; and in 83% of those cases there were signs of the patient being manic or hypomanic (that is to say, close to being manic), the commonest brain correlation being with right frontal deficits. The researchers concluded that ‘the occurrence of a “smiley” in the Rey complex figure is a rare, but reliable sign of functional impairment or structural damage to the right anterior brain’.¹²⁸

Whether we are well or ill, our left hemisphere is unaware of our shortcomings.¹²⁹ Feedback about performance is less effective in subjects with right hemisphere lesions, and they tend to underestimate their errors.¹³⁰ To quote Nikki Marinsek and colleagues, ‘*only* patients with right hemisphere brain damage continued to overestimate their ability to perform a task after they had *just failed* to perform the task in question [emphasis in original]’.¹³¹ And as Jaak Panksepp put it, the left hemisphere ‘appears

predisposed to repress negative emotions, and even *chooses* to confabulate'.¹³²

Intriguingly, there is an inverse problem for those with left hemisphere damage. Whereas the left hemisphere-intact patient underestimates the difficulty of a task and often performs badly, the right hemisphere-intact patient overestimates the difficulty of the task and often performs well. Though scoring highly on tests of working memory, selective attention and task switching – often higher than the left hemisphere-intact group – right hemisphere-intact subjects found themselves unable to tackle a problem because they were looking for something complex, and overlooked the easy solution:

After a successful solution, if patients were asked for the reason of their initial reluctances, a typical answer was that at the beginning his/her first impression was that one had to find something complex and previously unknown which could not be immediately clear from the situation. Therefore, a straightforward solution was ignored.¹³³

One patient said: 'I thought this would be too easy for a solution and that you gave me a more complex task.' Even more fascinating is that, according to Boris Velichkovsky, who has made a detailed study of patients with lesions in the left inferior parietal lobe, 'their problem lies in a general attitude towards task situations as *a priori unique* ... requiring tough mental efforts and sophisticated strategies of problem solving.'¹³⁴ This fits with the observation that, across a range of functions, while things are running routinely, the left hemisphere deals with them; but when they are exceptional – 'unique' or 'complex' – the right hemisphere is brought in to deal with the situation. It's as if the right hemisphere assumes that, if it is being drawn into involvement in the task, the problem is tough and unusual. The researchers found that, after an initial delay, patients 'suddenly arrived at the solution fast and correctly'. They call it 'difficulty of entrance in the task', and contrast it with a common problem after right hemisphere injury in particular, in which, by contrast, impulsivity, and instability of emotion and attention dominate the picture.

I have explained earlier why the left hemisphere is also unreliable in daily life: it has a tendency to jump to conclusions, to become entrenched,

to be unwilling to see other points of view and, frankly, to make stuff up, if it needs to, in order to maintain its point of view. And it has a desperate need for certainty. According to Marinsek and colleagues,

The left hemisphere appears to detest uncertainty; it creates explanations and fills in gaps of information in order to build a cohesive story and extinguish doubt.¹³⁵

Confabulation could be explained away as merely a confused response to a failure of memory, but it is more than that. Even when it remembers well, the left hemisphere exhibits a strong tendency to confabulate.¹³⁶ It may be said that the weird and wonderful delusions we have looked at are remote from our everyday experience. But their implications are not. Even in the normal situation, the left hemisphere is unreliable. Not only are subclinical delusional beliefs directly tied to left hemisphere activation in *normal participants* – not just psychiatric patients – but self-reference is related to the same left-sided area of brain activation, particularly delusional self-reference, the basis for paranoia.¹³⁷

FALSE 'MEMORIES' AND CONFABULATION

According to Michael Gazzaniga,

when presented with new information, people usually remember much of what they experience. When questioned, they also usually claim to remember things that were not truly part of the experience. If split-brain patients are given such tests, the left hemisphere generates many false reports. But the right brain does not; it provides a much more veridical account.¹³⁸

The psychological literature sometimes confuses two completely different kinds of phenomena under the heading 'false memories' (I am leaving to one side the phenomenon of 'false memory syndrome', an entirely different matter – though there, as in confabulation, a failure of right hemisphere inhibitory control has been posited).¹³⁹ On the one hand is a completely fabricated, experiential, or autobiographical, memory – 'I was in Holland yesterday' or 'I had three sisters', when, as an only child, you were yesterday in Birmingham. On the other is an increased willingness to say that a word or a picture now experimentally displayed to you was also present in a random display shown to you previously. The first is spontaneous, severe, and quasi-delusional, and is definitely commoner after right hemisphere damage. The second, often called 'false recognition', can be detected only experimentally, is mild, non-delusional and simply over-inclusive; and it may occur after damage to either hemisphere.

Having said that, a large number of studies show that false recognition of list items does in fact increase after right hemisphere lesions. This is principally because the left hemisphere is less interested in uniqueness, more in the category, and so may lump two similar items together.¹⁴⁰ For example, the right fusiform gyrus (an occipitotemporal region, important in face recognition) responds strongly to the specifics of an image, such as its size, colour, shape, or orientation; it habituates quickly if shown a picture of the same particular kitten, but not if shown a different one: 'Great! it's new, unique material!' Meanwhile the left fusiform gyrus habituates even when a completely different kitten is shown: 'Same old, same old ...'¹⁴¹ Remember

that to the right hemisphere everything is relatively new, whereas to the left hemisphere everything is already somewhat familiar. This may be one reason, at least, why people with right hemisphere deficit conditions such as ADHD (attention deficit and hyperactivity disorder) are easily bored;¹⁴² maybe even why we as a society are becoming so much in need of stimulation (there are of course others).

Patients with right hemisphere lesions, particularly in frontal regions, have been shown to produce more false memories than controls in studies using words,¹⁴³ faces,¹⁴⁴ and pictures.¹⁴⁵ Similarly a right hemispherectomy patient 'failed to recognize cards he had seen before, and then again he believed to have seen cards already which were shown to him for the first time'.¹⁴⁶ In a structural neuroimaging study healthy participants who generated the highest levels of false memories also possessed the lowest densities of grey matter in the same region of interest, specifically the right frontal gyrus.¹⁴⁷ In fact, according to Braun and colleagues, it has repeatedly been observed

that right hemisphere-lesioned patients make relatively more commission errors (incorrect recall, i.e., false recognitions) on memory tasks than do left hemisphere-lesioned patients. This literature has been almost completely ignored in the mainstream memory neuroscience literature.¹⁴⁸

The right hemisphere is more cautious, so that lesions in the right hemisphere make patients liable to 'recognise' what is not in fact familiar, while left hemisphere-lesioned patients tend to err in the opposite direction.¹⁴⁹

Normal subjects are better able to remember imagery in the left visual field, served by the right hemisphere.¹⁵⁰ Studies in two split-brain subjects, JW and VP, suggest that recognition in the right hemisphere is more veridical.¹⁵¹ Evidence suggests that memory in general, for anything other than verbal material, is more impaired after right hemisphere stroke than left.¹⁵²

Of course, the ideal situation is for the hemispheres to co-operate. However, even there, in the intact normal brain, the critical factor is what the right hemisphere communicates to the left; input from the left to the

right does not appear to improve performance significantly.¹⁵³ That, too, is supported by the findings from brain-damaged patients:

We found that patients with left hemisphere lesions were not impaired compared to controls in any of the tasks. Patients with right hemisphere lesions were not significantly impaired in memory for visual words, but were impaired in recognition of object pictures and sounds.¹⁵⁴

In other words, the left hemisphere made no difference whatever the type of study, but when it came to *non-linguistic* tasks, the input of the right hemisphere was the critical factor. And in another study right hemisphere-damaged patients performed worse on the recognition tests than either normal controls or left hemisphere-damaged patients, across all categories of stimuli.¹⁵⁵ Giving the left hemisphere more time does not help, but actually increases its error rate, while more time makes no difference to the performance of the right hemisphere.¹⁵⁶

The left hemisphere is more restricted, in terms of its capacity to make associations, than the right hemisphere.¹⁵⁷ Thus the same tendency that makes the right hemisphere capable of casting its perceptual and cognitive net wider than the left, making both more, and more remote, connexions than the left, must be expected at times to lead to false positives in recognition tasks.¹⁵⁸

One study sensibly concludes that ‘inter-hemispheric co-operation models may be necessary to fully account for false emotional memories’ (and their avoidance).¹⁵⁹ And another such study, entitled ‘How do our brain hemispheres co-operate to avoid false memories?’, concludes that, as regards false recognition tasks, ‘even though relatively large in number, these studies failed to reveal a superiority of one hemisphere’ (acting on its own).¹⁶⁰

If however, we return to the matter of false, autobiographical memories – our first category – there is a mass of evidence that the right hemisphere is more important for veridical memory.¹⁶¹ There is greater right prefrontal cortical activation during recognition of personal autobiographical memory than of other kinds;¹⁶² loss of autobiographical memories, particularly the ability to re-experience them as elements of one’s personal past, is

associated with damage to the right inferior frontal cortex, and to the long white matter tract, the uncinate fasciculus, that connects it to the anterior temporal lobe.¹⁶³ But, in any case, the left hemisphere, Gazzaniga's story spinner, seems not to be particularly interested in truth, as we have already repeatedly seen.¹⁶⁴

Insight – or lack of it – into one's own motivations betrays a similar hemisphere difference. There is a huge discrepancy, showing little overlap, between one's explicitly expressed motivations and those revealed implicitly by psychological tests making use of non-verbal imagery, such as the thematic apperception test (TAT), in which subjects are asked to construct a narrative to explain pictures of human situations, thereby revealing otherwise unexpressed motivations.¹⁶⁵ Our implicit motives are derived from deep, unconscious, affect-laden experience, whereas motives we attribute to ourselves are cognitively elaborated constructs.¹⁶⁶ A person whose TAT stories are full of imagery related to having impact on others through all sorts of means – a power-motivated person, in other words – may describe himself as not interested in power at all. Of course, sometimes we are guided by our own explicit self-ascriptions and goals, and at others by our implicit motives, so both are relevant to understanding how we behave. According to David McClelland, who developed the influential Achievement Motivation Theory, implicit motives are a right-hemispheric phenomenon and explicit motives are left-hemispheric.¹⁶⁷

All in all, the left hemisphere just is not reliable about the self. And since, in a sense, the self is all we know directly, that's got to be a handicap. 'Humankind', wrote T.S. Eliot, 'cannot bear very much reality'.¹⁶⁸ In as far as this reflects the way of being of the left hemisphere, he was certainly right.

MAGICAL THINKING

Finally, let's turn to magical thinking, since it has been linked by some researchers with the right, rather than left, hemisphere. Magical thinking is defined as 'belief in forms of causation that by convention are invalid', a phenomenon which exists in all of us to some extent. Is it, though, in fact associated with the right hemisphere? Since it involves making more remote connexions, it would make sense if it did.¹⁶⁹ Magical thinking is associated with creativity;¹⁷⁰ and, for similar reasons, creativity is highly right hemisphere-dependent (see Chapter 8 below).

But the laterality of magical thinking is not clear. It may be left hemisphere-related: for example, inhibition of the left lateral temporal area produced a significantly reduced tendency to report apparently 'meaningful' events.¹⁷¹ Direct studies of the laterality of magical ideation have proved negative or inconclusive.¹⁷²

In more extreme form it is part of the picture of schizotypy¹⁷³ – a personality type that has some features in common with schizophrenia, but without (except for brief episodes) loss of contact with reality. Schizotypal individuals are often labelled 'odd' or eccentric': they typically exhibit peculiar behaviour, speech mannerisms, constricted affect, have few or no close friends, find trusting and socialising problematic, and are unduly suspicious – none of which suggests right hemisphere enhancement.

You might expect levels of magical thinking, though not schizotypy, to be higher among religious subjects, and this is the case in males (though not females) that have been studied; yet there is no association between religion, in either sex, and the other factors that constitute schizotypy.¹⁷⁴ There are also higher levels of magical thinking in experienced meditators and mindfulness practitioners, but again no relation with other measures of schizotypy: for example, meditators showed *lower* levels of suspiciousness and social anxiety than non-meditators.¹⁷⁵

And, if magical thinking is indeed bound up with schizotypy, schizotypy itself shows no clear lateralisation. To quote one contemporary study,

Unfortunately the previous literature on links between schizotypy and hemispheric asymmetry is inconsistent, with some research indicating that elevated schizotypy is associated with relative right over left hemisphere shifts, left over right hemisphere shifts, bilateral impairments, or with no hemispheric differences at all ...

[176](#)

The authors of this study conclude that any link between schizotypy and laterality is either so subtle that it is incapable of being assessed by traditional methodologies, or does not exist – or is mediated by other factors altogether. And if schizotypy were really associated with the right hemisphere, it would remain to be explained why schizotypals characteristically display not only social and emotional impairments, but deficits in sustained attention,[177](#) since this strongly suggests diminished, rather than enhanced, right hemisphere activity.

All of which, along with the formulation of magical thinking as ‘belief in forms of causation that by convention are invalid’, leads one to wonder how valid the whole construct of magical thinking itself really is. Is it just the modern Western stigmatising of a normal and useful thinking style present in all other cultures? Animist intuitions, which we would conventionally consider ‘magical’ thinking, are deep in the psyche of, for example, the modern Japanese, whatever their religion, and are not related to educational level.[178](#) Studies of magical thinking in the context of ethnicity are few, but one carried out in New Zealand suggests that magical thinking is commoner among Maoris than among Western settlers.[179](#) And there is more in common than one might at first think between the average Westerner’s acceptance of the efficacy of aspirin and the African villager’s acceptance of a spell from the witch doctor: neither understands, or even asks for, a causal explanation, but accepts treatment on the basis of authority and past experience. As anthropologist and philosopher Robin Horton puts it, ‘the layman’s grounds for accepting the models propounded by the scientist are often no different from the young African villager’s ground for accepting the models propounded by one of his elders.’ [180](#)

However, even in the West, there is a significant difference between what we say we believe (which is what rating scales assess) and what we *actually* believe when push comes to shove. For example, in one study

British adults were shown an impossible event – the unexpected destruction of an object in an apparently empty box – for which both a bogus scientific explanation and a bogus magical explanation were given. Unsurprisingly, in their verbalised judgments, the subjects showed ‘a higher degree of credulity toward scientific explanations than toward magical explanations’. However, in another situation, where the stakes were high enough, British adults endorsed scientific and magical explanations to an equal extent. ‘This result’, the experimenters conclude,

was in support of the main hypothesis: scientific education eliminates non-institutionalised magical beliefs from adults’ verbal thinking, yet in non-verbal behavioural responses, adults’ non-institutionalised magical beliefs are still present.¹⁸¹

The experiment was then repeated in Mexico. In pre-test conditions, Western participants showed themselves much less ready to believe in magic than their Mexican counterparts. But ‘in their non-verbal behaviour or reactions in the high-risk condition, Mexican and British participants endorsed beliefs in the efficacy of the magic spell to an approximately equal extent.’¹⁸² And they conclude (the italics are theirs):

*When the risk was high, non-institutionalised magical beliefs ascended to the level of consciousness and British participants showed credulity toward magical beliefs to the same extent as did Mexican participants.*¹⁸³

In another experiment, British graduates and undergraduates, ‘all informed disbelievers in magic’, were asked to consider an imaginary scenario in which a witch approached them on an empty street and offered to put a magic spell on their future lives.¹⁸⁴ Revealingly, the proposal induced different reactions depending on whether the proffered spell was good or bad. Whereas 50% of participants declined the good spell, all participants declined the bad spell:

contrary to their self-proclaimed disbelief in magic, in their justifications of why they had rejected the bad spell, the participants

admitted that the bad spell might actually affect their future lives in a magical way ... [U]nder certain conditions, children and adults who initially deny having magical beliefs will openly and willingly acknowledge that they believe in magic, and the number of such participants will be close to 100%.¹⁸⁵

This finding has been replicated in other studies.¹⁸⁶ And in another experiment, this time not involving magic as such, but an irrational model of causation (a ‘belief in forms of causation that by convention are invalid’), Western participants were asked to drink from two glasses of water, both of which contained a small amount of sugar syrup only. The investigators assured participants that both were completely safe, but one was to be labelled ‘poisonous’. They even asked participants to select which label went with which glass, proving that the labels were strictly meaningless. Even so, participants were hesitant to drink from the glass once it was labelled ‘poisonous’. They were even reluctant to drink from a glass labelled ‘not poisonous’ – the very presence of the word ‘poison’ on the label seemed enough.¹⁸⁷ In yet another study, again Western participants were reluctant to wear ‘Hitler’s sweater’.¹⁸⁸ And educated, non-superstitious Western subjects can easily be induced to believe that they have somehow influenced another person’s decision merely by concentrating on it.¹⁸⁹

So is magical ideation, in fact, normal? Scores on the Magical Ideation Scale up to nearly 14/20 in men, and up to nearly 16/20 in women, would lie within one standard deviation of the mean (that is to say, would still only capture 68% of normal subjects), a score that has been normalised on over 1,500 Western college students. Perhaps magical ideation is functional, rather than dysfunctional. According to Eugene Subbotsky, his studies ‘confirmed the assumption that magical thinking is relevant for learning and education: in some conditions, viewing magical effects appears to enhance creative thinking, helps memorize certain aspects of the display, and helps differentiate between fantasy and reality.’¹⁹⁰ That claim seems a little ambitious to me, but whether that is so or not, ‘magical ideation’ is by definition not in itself delusional, though it may be on a continuum with delusion. It simply suggests a greater willingness to consider connexions, some of which are no doubt non-existent, but some of which may simply

not be recognised in the current Western standard model. As science advances, it successively reveals that animals, birds and fishes are capable of far more spectacular feats of cognition than we were prepared only a few years ago to allow, including some that we cannot as yet explain. Some physicists are now prepared to accept a number of realities that are contrary to what used to be conventionally accepted, such as apparent action at a distance, the apparent influence of consciousness on the behaviour of matter, and the possibility of holographic existence. Biology, too, teaches us that the mind can have effects on matter (eg, the placebo effect), and that information acquired in one lifetime can be transferred from one generation to the next (epigenetics), both of which used to be denied. Probably some of what we consider magical thinking will remain so; probably some will not. And that which is ultimately without foundation may hardly be disadvantageous, simply being an exaggeration of a cautionary principle that makes sense in terms of survival: it's better to see tigers in leaf patterns where there aren't any, than to fail to spot tigers in leaf patterns where there are.

Magical thinking may not be pathological at all, except in extreme cases. It suggests to me an inverted U-shaped curve. Living at either extreme means being duped. Too little means you are not only unimaginative and uncreative, but at risk of failing to spot the obvious (the tiger that is there); too much means you are at risk of delusion (spotting the tiger that isn't). According to Peter Brugger, head of neuropsychology at University Hospital, Zurich, and probably the world's leading researcher into magical thinking, to be 'totally "unmagical" is very unhealthy', and reduces one's capacity to appreciate value and to take enjoyment in life.^{[191](#)}

JUDGMENTS FORMED ON INTUITION

Most PET imaging studies have shown predominantly right-sided orbitofrontal activation while involved in decision-making, such as assessing conflicting possibilities – eg, frequent small rewards versus occasional large rewards – on a risk task.¹⁹² Lesion studies suggest that evaluating decisions depends, in general, on the right ventromedial prefrontal cortex (VMPFC).¹⁹³ In a comparison between normal subjects and addicts in a functional MRI task, healthy controls were found to have significant right-sided activation (in the lateral orbitofrontal cortex, superior frontal gyrus, dorsolateral prefrontal cortex, inferior temporal gyrus, inferior parietal gyrus, lingual gyrus, occipital cortex and cerebellum): but the addicts, whose decision-making was chaotic and irrational, showed a reverse pattern:

During decision-making, control participants showed relatively greater activation in the right dorsolateral prefrontal cortex, whereas participants engaged in current or previous drug use showed relatively greater activation in the left orbitofrontal cortex.¹⁹⁴

There is, however, evidence from three studies that I am aware of that this may apply only to men, and that in women, it is the *left*, not the right, VMPFC that is more important in decision-making.¹⁹⁵ If this turns out to be more widely replicated, it joins a similar anomaly regarding sex-specific lateralisation in the amygdala, where activity in relation to emotionally charged memories is once again right-lateralised in men, left-lateralised in women.¹⁹⁶ To an extent the finding that the VMPFC and the amygdala vary *together* makes sense, in that the VMPFC is involved, amongst other things, in dealing with affect-laden memories, as is the amygdala.

An aside on differences between sexes

As to the significance of such (sexually divergent) findings, there are very few clues at this stage. One possible theory is that while their effect

may lead to behavioural differences in some instances, they might just as well be designed to prevent such differences (when, for instance, they would be maladaptive), by compensating for sex differences in other physiological conditions, such as endocrine function.¹⁹⁷ If, for example, the right frontal cortex is so crucial in females for underwriting the empathic relationship with the infant, it may not be possible for the same area to make risk decisions, which, from an evolutionary psychology point of view, are more the domain of the male. But we would need more research into what other sex-specific aspects of lateralisation exist to have a basis for a useful global conjecture.

What seems to be clear, however, is that striking sex differences in functional asymmetry do exist, and they have been ascribed, at least in part, to the action of sex hormones, especially testosterone.¹⁹⁸ Many individual studies have found greater functional asymmetry in men than women,¹⁹⁹ and all five reviews of the literature of which I am aware reach the same conclusion,²⁰⁰ though there are occasional contrary findings.²⁰¹ There are a number of corollaries of this. Men are more likely to display verbal deficits after left hemisphere lesions and non-verbal deficits after right hemisphere lesions, whereas the deficits are less predictable for women.²⁰² Additionally male brains exhibit greater *intra*hemispheric, and females greater *inter*hemispheric, structural connectivity.²⁰³ What these findings together suggest is that the hemispheres are more specialised in the male than the female brain.²⁰⁴ This could be expected to lead to complementary patterns of strengths and weaknesses.

In normal adults, sex differences in functional cerebral asymmetries have been reported in wide range of areas, including decision-making, as above, but extending to areas such as language, working memory, spatial orientation, spatial attention, face perception, verbal and musical creativity tasks, emotional 'processing' and appreciation of beauty.²⁰⁵ Except in the case of language, males have generally been found in every one of these areas to be more reliant on the right hemisphere than females.

Doreen Kimura proposed that males prefer to employ right hemisphere, non-verbal systems whereas females prefer to employ left hemisphere, verbal systems.²⁰⁶ Women tend to use a more verbal strategy than men in non-verbal tasks.²⁰⁷ They also employ a different cognitive strategy from men in navigation tasks, relying predominantly on landmark [local or

‘egocentric’] information, ‘whereas men used both landmark and geometric [global or ‘allocentric’] information’.²⁰⁸ In general, as we have seen, we transfer more information, and more swiftly, from the right hemisphere to the left, but this asymmetry seems to be less pronounced in women, who show more symmetrical interhemispheric transfer times than men.²⁰⁹

According to Belinda Pletzer, one of the leading researchers in the area, many lines of evidence show that males process more globally, females more locally: there is ‘a stronger focus on the global level (holistic processing) in men and a stronger focus on the local level (decomposed processing) in women’.²¹⁰ The first is more right hemisphere-dependent and the second more left hemisphere-dependent. Men show greater right hemisphere activation in tasks assessing global attention.²¹¹ In women, global choices are slower than local choices, whereas in men they are faster. Testosterone is positively related, and progesterone negatively related, to the use of global strategies.²¹² Oral contraceptive users show enhanced global advantage compared to women whose menstrual cycle is natural.²¹³ It has repeatedly been demonstrated that men tend to remember the gist of an emotional story more strongly than women, while women tend to remember the details of the same story more strongly than men.²¹⁴ A study by Deborah Waber and Jane Holmes asked girls and boys simply to copy the Rey-Osterrieth figure (see Fig. 13 above). They found that

at the youngest age, females reproduced more parts of the design (ie, scored higher on accuracy) than did males. This difference was accounted for by the presence, in the girls’ designs, of internal details absent in those of the boys. In addition, females drew more discrete parts than males, even when the total number of parts was statistically controlled. For males the external configuration of the design seemed to be more salient ...

They further found that, at age 11,

males drew their designs in long, sweeping, continuous lines, while females drew theirs part by part. At age 13, the stylistic difference between the sexes had once again disappeared ... The male superiority in spatial ability appears on three kinds of tests. The first

is spatial visualisation ... The second is perceptual disembedding ... The third is mazes ... These differences do not appear reliably until adolescence. The language abilities at which females show an advantage are clearly associated with left hemisphere function.²¹⁵

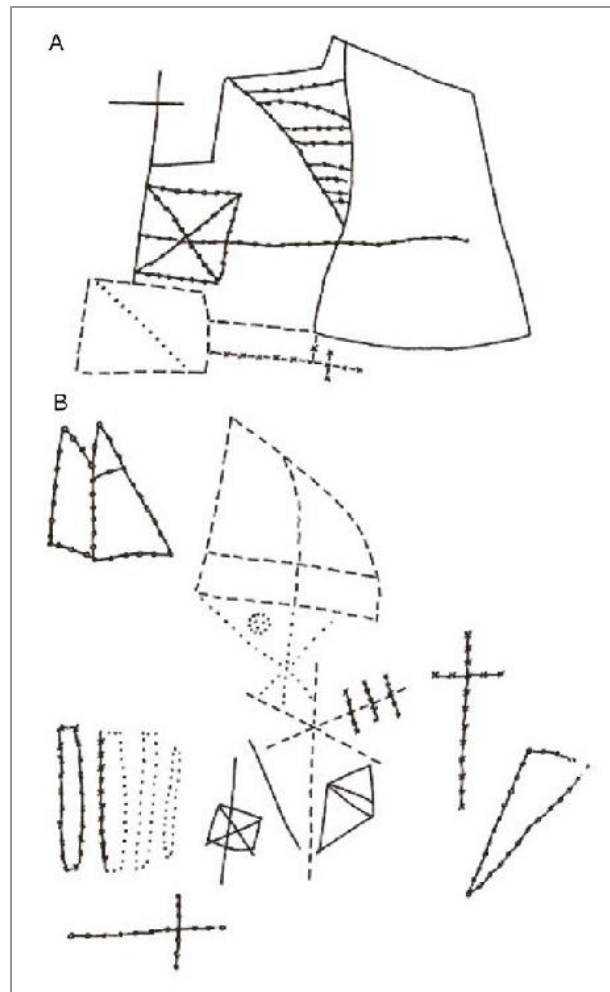


Fig. 15. Copies of the Rey- Osterrieth figure drawn by (A) a 5 year-old boy and (B) a 5 year-old girl. The different line styles are intended to give information about the order in which parts of the figure were drawn: see original for details (from Waber 1979)

In another study in children, 40 girls and 39 boys between the ages of four and 12 years undertook a perceptual judgment task. 'Boys were significantly more global in their perceptual judgments than girls at all ages. Younger children of both sexes were less global than older children. Results were consistent with developmental models that suggest an early left

hemisphere advantage for girls and a right hemisphere advantage for boys'.²¹⁶ And in a study of adult male and female composers, the compositions that received the highest ratings were by subjects that had smaller left hemisphere advantages in verbal processing, suggesting a greater reliance on the right hemisphere. However, though male composers across the board showed this smaller left hemisphere advantage compared with non-musicians, the opposite was the case with female composers taken as a whole, who showed greater left hemisphere advantage. This is in keeping with the fact that in male adults musical talent appears to be associated with high scores on spatial tests, whereas adult women show no such association.²¹⁷

I am sometimes asked whether one can say that the left hemisphere is in some sense 'male' and the right hemisphere 'female'. I know why the question is asked, but there can naturally be no such simple equation; and, as I pointed out at the beginning of *The Master and his Emissary*, if anything the evidence might be taken to point the other way. Quite apart from what I have just related, one needs to take into account a number of other facts that ought to give pause for thought. For example, though the right hemisphere is larger than the left, this effect seems to be more marked in males.²¹⁸ The surface area of the right hemisphere is also greater than that of the left, but the effect is greater in males.²¹⁹ It is testosterone that causes the right hemisphere to grow faster *in utero* in males than the left, actually inhibiting left hemisphere growth in order to produce resulting compensatory growth of the homologue regions in the right hemisphere.²²⁰ Higher levels of foetal testosterone cause rightward enlargement of a posterior part of the corpus callosum, the isthmus, which projects mainly to parietal and superior temporal areas.²²¹ The larger grey matter volumes found in the right temporoparietal junction and posterior superior temporal sulcus in males correlate positively with foetal testosterone levels.²²² Testosterone causes relative cortical thinning in the left hemisphere in males, and causes initially relative cortical thickening in the right hemisphere in females, though this effect in females is reversed later in development.²²³ Left hemisphere language-associated cortical regions are proportionally larger in the female brain.²²⁴ Prenatal testosterone causes left hemisphere lateralisation of language in girls and right hemisphere lateralisation of emotion recognition in boys.²²⁵ A left hemisphere focus for

speech functions matures earlier in females than males.²²⁶ While there are 20–30% more neurones in the male neocortex than the female neocortex overall, the difference is greater in the right hemisphere.²²⁷ Women have significantly larger neuronal somata in the left hemisphere than the right, which, it has been posited, relate to higher rates of right-handedness in females than males, and the female language advantage.²²⁸ And the two most reliable sex differences, neuropsychologically speaking, are that females in general have greater verbal facility and males better visuo-spatial skills, and that this is related to testosterone.²²⁹ Females do better academically where material is familiar and prepared.²³⁰ Finally, in rats, too, it has been found that the right cortex is thicker than the left in males, but the left thicker than the right in females.²³¹

The situation is undoubtedly complex.²³² There are differences between the effects of prenatal and adult levels of testosterone, metabolites of testosterone have differing actions, the same levels of testosterone in males and females have differing actions, and there is in general no simple dose-response curve.²³³ Meanwhile, the lesson we should learn is that all studies of brain structure and function should report results for males and females separately, and indeed, since sex hormones affect lateralisation of brain functioning, arguably differentiate women according to phase of the menstrual cycle and contraceptive use: ‘studies comparing men and women may fail to detect significant differences without controlling for hormonal contraceptive use’.²³⁴ We do not know how many important brain functional asymmetries have been missed by aggregated data cancelling out an otherwise significant effect.²³⁵ Where it is lateralised to different hemispheres in males and females, the most clearly lateralised function might potentially show no lateralisation whatever if equal numbers of men and women in a study are, as is often the case at present, grouped together.

THE ROLE OF REASONING IN FORMING JUDGMENTS

Reasoning is classically associated with the left hemisphere, but in reality most studies show that both hemispheres contribute to reasoning; and the part played by the right hemisphere is significant, as we shall see.²³⁶ Several studies report impairment in reasoning accuracy as a consequence of lesions in the left hemisphere,²³⁷ but others report impairments in reasoning following right hemisphere damage that are in reality more of a handicap. That's because they involve not just hypothetical logical problems, but inferring complex and ambivalent or implicit meaning, inferring what is going on in another person's mind and knowing how to understand the situation as a whole. As I have repeatedly emphasised, the old dichotomy – left hemisphere rational, right hemisphere emotional – is profoundly mistaken, on both counts; not to mention the fact that reason and emotion are never entirely separable. Knowing the limits to reason is essential to understanding. If not coupled with contextual, implicit and intuitive understanding (in none of which the left hemisphere excels), it can magnify error. As Sass and Pienkos point out: 'The most deluded patients with schizophrenia tend to be those whose thinking is more logical.'²³⁸ This is in line with Eugène Minkowski's insight that the problem in psychosis is not loss of reason, but its hypertrophy: 'The mad person is much less frequently "irrational" than is believed: perhaps, indeed, he is never irrational at all.'²³⁹ Here he was anticipated by G.K. Chesterton:

If you argue with a madman, it is extremely probable that you will get the worst of it; for in many ways his mind moves all the quicker for not being delayed by the things that go with good judgment ... He is the more logical for losing certain sane affections. Indeed, the common phrase for insanity is in this respect a misleading one. The madman is not the man who has lost his reason. The madman is the man who has lost everything except his reason.²⁴⁰

As Vinod Goel, one of the leading researchers in this field, rightly says, 'there is a long tradition in neuropsychology, backed by robust lesion data, suggesting left hemisphere dominance for reasoning processes'. Yet the

situation is not nearly as straightforward as this makes it sound, as he himself goes on to admit. For a start – and it is just an incidental, but nonetheless telling, observation – of the three journal papers that he cites in support of this remark, the first is a famous paper that argues, entirely plausibly, that the left hemisphere is an ‘interpreter’, that misuses reason to confabulate – makes things up – rather than admit it does not know what it is talking about, whereas the more tentative right hemisphere sticks to what it knows, and is closer to the truth.²⁴¹ The second paper demonstrates that the left hemisphere misuses reason by adopting a superficially ‘clever’ strategy that is actually irrational, if thought through properly, and gets the answer wrong, while the right hemisphere does the rationally superior thing and gets the answer right.²⁴² And the third paper, while not denying that the left hemisphere is importantly involved in the reasoning process, is concerned to make the point that the right hemisphere, in the end, by ‘an intelligent process akin to problem solving’, deduces from visual information the nature of the world better than the left. The paper’s author, Michael Corballis, another distinguished hemisphere researcher, postulates the existence of

a ‘right-hemisphere interpreter’ dedicated to constructing a representation of the visual world ... the right hemisphere can be conceived as more perceptually intelligent than the left ...[the left hemisphere] has traditionally been regarded as the ‘major’ or ‘dominant’ hemisphere, with the right hemisphere relegated to a minor, supporting role. This conceptualisation overlooks the fundamentally ambiguous nature of visual perception, and the profound ‘intelligence’ required to create a veridical representation of the world from the information provided by the retinal image.²⁴³

We have seen the stark evidence of this in this chapter.

Research into reasoning is complicated by many factors, not least being the various phenomena covered by the term and the many ways of trying to isolate them in an experimental design.²⁴⁴ I cannot pretend to be comprehensive here – that would be another book with another purpose, and I’d not be the best person to write it. But I will try to draw a number of

distinctions, from which, I believe, a new perspective on reason and intuition emerges, informed by understanding hemispheric differences.

Induction and deduction

One ancient distinction in reasoning processes is that between induction and deduction. Induction is, in a more immediate sense than deduction, about predicting the future, and is based on observing the ‘form’ so far: the sun rose every morning to date, so it will in all likelihood do so tomorrow. Induction relies on the familiar remaining unchanged. This kind of reasoning is particularly associated with the left hemisphere, which makes sense if we realise that the left hemisphere needs to be able to predict, since its main concern is a plan of action. It therefore, unsurprisingly, likes predictability, familiarity and certainty. With that in mind, one has to be aware that this kind of reasoning is nonetheless *intrinsically uncertain*; the result is that the tendency of the left hemisphere is to treat things as more certain than they are. This can give rise to a problem. It could lead you to believe, for example, that all swans are white, simply because you have never seen a black one. Nassim Nicholas Taleb famously wrote a book, entitled *The Black Swan*, about problems of this kind: in his view they led to the Western economic collapse of 2008.²⁴⁵ The Covid-19 crisis would be another example of something we had come to believe was vanishingly rare, but if it did happen would be devastating. So we chose to ignore the possibility until it was too late. The ultimate case is that of environmental destruction, and extinction of species: it’s seemed OK round here to date, so there isn’t a problem. It’s the right hemisphere that is on the alert; the left is too busy getting the next bonus.

Inductive reasoning is based on an assumption of the normal and expectable. And it involves brain areas that are used to recall general knowledge – a typical left hemisphere task.²⁴⁶

Inductive reasoning lies behind the so-called *Einstellung* effect. This is the tendency to get fixed in one’s method of approach, so that one fails to see other, better, ways of seeing a situation, or of tackling a problem. Once one has mastered a way of doing something that works well enough in one situation, one tends to carry on applying the same method to situations or problems in which it is inferior or inappropriate. It was most famously

demonstrated in a test devised by Abraham Luchins in 1942. He found that the tendency increased with age in adults, and was somewhat more marked in females than in males.²⁴⁷ It has since been found, as mentioned, to be less prominent in non-Westerners, who are more flexible in their thinking. Westerners ‘may never even consider that the problem could have multiple solutions, until explicitly told “Don’t be afraid to try new things” which clearly states the possibility of multiple solutions.’²⁴⁸

Deduction, by contrast, is seeing that something is *implied* by what one knows, and is latent or implicit in it – though not yet explicitly stated. To take another example from the fauna of Australia: if mammals are those that suckle their young, and the platypus suckles her young, the implication is that the platypus is a mammal, even if she has a beak and lays eggs. Deduction is about uncovering and integrating latent meaning so long as it makes sense, and rejecting it if it is discrepant – but not just because it is *unfamiliar*, or necessitates a recasting of one’s thinking. If such a recasting seems reasonable, an advance in understanding has been achieved.

Deduction is more persuasive than induction when deployed as an argument. For example, explaining that the mode of transmission of HIV makes it impossible to contract AIDS by casual contact (deduction) is more convincing than stating that no-one has yet caught AIDS from casual contact (induction).²⁴⁹

The right hemisphere plays a bigger part in deduction than induction, though in both the left hemisphere generally plays the leading role – with some important exceptions, to which we now turn.²⁵⁰

What do we know about the ways in which each hemisphere contributes to reasoning?

It has long been well-known that we do better at reasoning tasks when the logical conclusion is consistent with our beliefs about the world: when it is not, we make more mistakes.²⁵¹ This is because, when we reason about familiar situations, we automatically bring into play what in the jargon is called a heuristic, a ‘rule of thumb’ for that type of situation, based on experience, enabling a quick response. But when the situation is unfamiliar, we fall back on formal reasoning methods to solve the problem, which take more time. Where there is a conflict between our beliefs and the logical inference, we need to inhibit the dominant (‘quick and dirty’) response associated with our belief bias, and engage more formal reasoning processes.

In which of these situations do you imagine the right hemisphere plays more of a role? The first, ‘quick and dirty’ one, right?

Wrong. It is the *left* hemisphere that tends to reach hasty conclusions on the basis of what seems likely²⁵² – and it does well as long as the stimuli follow predictable patterns, less well when they do not.²⁵³ One of the most recently evolved areas of the brain, the right dorsolateral prefrontal cortex, plays an especially critical role in counterbalancing this tendency.²⁵⁴ This part of the brain has repeatedly been shown to be crucial to judgments where there are either conflicts between the facts being put forward and what we know from experience, or between what we know from experience and what reasoning suggests.²⁵⁵ Indeed, you could say that it acts somewhat as a wise judge would: taking into account all circumstances, and not being either swayed by bias or driven by untempered rationality. The mere presence of counterfactual statements is sufficient to engage this region of the right frontal cortex.²⁵⁶

There is a distinction to be drawn between two kinds of false conclusion: one drawn correctly but from false premisses, and one drawn incorrectly but from true premisses. An example of the first might be ‘the Sahara is freezing cold; there is much ice in the Sahara’; and of the second ‘the Sahara is hot and dry; there is much ice in the Sahara’. In the second type the conclusion is judged by both hemispheres to be false. However it is not so with the first type. An experiment by Deglin & Kinsbourne which I will describe in Chapter 10 demonstrates that the right hemisphere judges the conclusion in the first type to be false, as you might imagine; however, the left hemisphere judges the conclusion to be correct, since the logical structure is intact.²⁵⁷

Deciding when to go with logic and when to go with real-world experience activates the right hemisphere, since, when it is *inactive*, we answer the question ‘is this true?’ by reference to the internal logic of the system alone.²⁵⁸

I mentioned bias: if the right lateral prefrontal cortex is impaired, we are more swayed by our prior beliefs.²⁵⁹ One related difference between right and left prefrontal cortex activation is that the left dominates where belief bias points to the correct conclusion, and, by contrast, the right dominates where it does not.²⁶⁰ Belief bias is in fact generally associated with the left hemisphere, not with the right hemisphere.²⁶¹ In first detecting conflict

between our bias and the logic; in then inhibiting our ‘quick and dirty’ response; and finally in maintaining the subsequent chain of reason, it is the right, not the left, hemisphere that matters. And in fact one of the right hemisphere’s roles in logic seems to be the active searching out of counter-examples.²⁶² Perhaps, to the extent that rationalising is a function of the left hemisphere, Mercier and Sperber are right that rationality is not about seeking the truth – more about finding reasons that enable one to win an argument.

More generally, as I have tried to convey, it is the right hemisphere that helps us to get beyond our familiar simulacrum of the world, with its self-reinforcing tendency – what I have dubbed the hall of mirrors – to a more authentic, ‘in touch’, actuality. But it is not that the right hemisphere just sides always with experience. It only does so when it thinks on balance that this gives an answer truer to the questioner’s intention. If specifically instructed to ignore the real world, and go with the logic, the right hemisphere is actually *better* able to do so than the left hemisphere.

Remember that, in the experiment of Deglin & Kinsbourne which I referred to, the question was not whether the syllogism was structurally correct – but whether the conclusion was *true*. And there the right hemisphere protested that the conclusion was not true, while the left hemisphere blithely accepted it as correct. However, in another kind of experiment, where the question is the very different one: ‘is this syllogism structurally correct?’, it is the right hemisphere which gets the answer correct, even when the conclusion flies in the face of one’s experience. The left hemisphere is distracted by the familiarity of what it already thinks it knows, and gets the answer wrong.²⁶³ According to Vinod Goel, one of the architects of that experiment, and one of the leading researchers in this area, ‘this conflict detection role of right lateral/dorsal prefrontal cortex is a generalized phenomenon that has been documented in a wide range of paradigms in the cognitive neuroscience literature’.²⁶⁴

To put it crudely, the right hemisphere is our bullshit detector. It is better at avoiding nonsense when asked to believe it, but it is also better at avoiding falling prey to local prejudice and just dismissing rational argument because the argument does not happen to agree with that prejudice.²⁶⁵

And the left hemisphere? ‘The left hemisphere’, according to Ramachandran, ‘is a conformist, largely indifferent to discrepancies,

whereas the right hemisphere is the opposite: highly sensitive to perturbation.’²⁶⁶ Elsewhere he says: ‘the left hemisphere’s job is to create a model and *maintain it at all costs*’.²⁶⁷ Older subjects, as it turns out – sad news for those of us who have opted to grow older – exhibit a greater belief bias than younger subjects, and rely less on the right lateral prefrontal cortex.²⁶⁸

According to Ramachandran, the left hemisphere adopts a theory, and then actually denies what doesn’t fit the theory.²⁶⁹ The evidence that this is the case is so extraordinary and compelling that we would not believe it if we had not already seen it. It will swear black is white. It’s not just intellectual matters over which the left hemisphere is in denial: ‘left-hemisphere denial may also involve the disappearance of much simpler visual percepts.’²⁷⁰ A nice optical illusion demonstrates this, according to Agnes Funk and Jack Pettigrew who have extensively researched motion-induced blindness. Though in itself trivial, it is at least memorably vivid. It can be found on the Wikipedia page for ‘motion-induced blindness’.²⁷¹ Three yellow dots are arranged against a rotating grid which *at no point* obscures them; yet, with fixation of gaze at the centre of the image, the dots continually disappear and reappear. The point made by the researchers, who studied the phenomenon, is that it is the product of interhemispheric rivalry: ‘the right hemisphere seems to adopt a veridical [true to reality] representation with appropriate weight given to all physical stimuli present’; whereas ‘the left hemisphere is likely to adopt an interpretation or hypothesis that is internally consistent, and then to deny discrepancies that do not fit with that interpretation.’ Hence the alternation: now you see it, now you don’t. The left hemisphere says ‘you shouldn’t be able to see that’ – and, as a result, you actually can’t: the right hemisphere says, ‘but it’s there’ – and so you can. The point is that, despite your being perfectly well able to see something, you can’t see it because of a theory that the left hemisphere has about it. ‘The left hemisphere seems to suppress sensory information that conflicts with its idea of what the world should be like’, writes John Whitfield: ‘the right sees the world how it really is.’²⁷²

The left hemisphere’s approach is theoretical, whereas ‘the right hemisphere plays a prominent role in detecting inconsistencies between hypotheses and reality.’²⁷³ Regions in the right hemisphere are active when subjects discover evidence indicating that their hypothesis may not be

correct,²⁷⁴ and it is the right hemisphere that updates the hypothesis according to the new, discrepant, information.²⁷⁵

To the extent that what I have had to say relies on imaging data, let me reassure the reader that the imaging results regarding right frontal activation for conflict detection are also strongly supported by lesion data,²⁷⁶ as is the role of right frontal activation in dealing with indeterminate information.²⁷⁷

Left hemisphere-damaged patients (whose right hemispheres were intact) were more inclined to modify the hypothesis they were working with when faced with new, conflicting evidence. In contrast, the right hemisphere-damaged patients (whose left hemispheres were intact) tended to maintain a hypothesis even in the face of negative feedback:²⁷⁸

When the right hemisphere is damaged, patients' hypotheses become rigid and impermeable to conflicting evidence ... These findings suggest that a functioning right hemisphere is necessary to detect inconsistencies and update flawed hypotheses accordingly.²⁷⁹

This touches on another familiar hemisphere difference – rigidity and flexibility. When problem-solving, it is the right hemisphere that is capable of set-shifting, rather than just, as the left hemisphere is inclined to do, opting for 'a more detailed version of the same state'.²⁸⁰ (On which hemisphere is better at generating new hypotheses the jury is still out.)²⁸¹

So both hemispheres contribute to both kinds of logic. That is intuitively understandable. While inductive logic is drawn from experience, not theory – a good start, involving both hemispheres – the left hemisphere's efficient use of what it considers facts can cause it to harden up its inferences into automatic, 'ready-to-go' responses, and thus the left hemisphere fails to detect situations where induction, importantly, breaks down: black swans. Problems calling for a search for counter-examples to conclusions recruit the right frontal pole.²⁸² It is the devil's advocate.

There are also situations where the premisses do not justify the conclusion that is drawn – not experientially, as in the case of Deglin & Kinsbourne's experiment, but logically – such as:

1. Either he is a college student or he is registered to vote (or both);
2. It is not true that he is both a college student and a regular golfer;

3. He is registered to vote.

In such cases, again, it is the right hemisphere that is the more important in deciding correctly the validity of whatever conclusion is drawn. Goel tested patients with unilateral frontal lobe lesions on their performance of a deductive task, while varying the completeness of information required to reach a valid conclusion. He found that patients with left prefrontal cortex lesions were selectively impaired in trials with complete information, whereas patients with right prefrontal cortex lesions were selectively impaired in trials with incomplete information. ²⁸³ Similar findings were made by two other studies of deduction, in which subjects were scanned while judging the correctness or otherwise of complex syllogisms that involved detecting incomplete or invalid arguments: in both it was the right posterior and frontal brain areas that appear to have been primarily engaged, rather than the usual left or bilateral prefrontal cortex activation. ²⁸⁴

As Goel and colleagues put it, the right prefrontal cortex has ‘a critical role’ to play in reasoning about incompletely specified situations, probably because it can maintain ‘ambiguous mental representations that temper premature over-interpretation by the left hemisphere.’ ²⁸⁵ In real life, few situations are completely specified, familiar or predictable – a problem that hangs over the research, because the difficulties in simulating the extent and importance of uncertainty encountered in real life within an artificial lab situation (pressing buttons in a scanner) are considerable. But, unlike the left hemisphere, the right hemisphere can operate with several types of uncertainties: inexactness, incompleteness, probabilities, fuzziness, observer error, and so on. ²⁸⁶

The prevalence of uncertain, incompletely specified, unfamiliar and unpredictable situations in real life lends strong support to Goel’s comment:

While the left prefrontal cortex is critical to reasoning processes, our data suggest that this is only half of the story. The right hemisphere, more particularly the right ventrolateral prefrontal cortex has critical roles to play in reasoning processes that go beyond ‘the perception of visual information’. One of these roles is to actively maintain indeterminate/incomplete patterns and prevent the left prefrontal

cortex from premature completion, until they can be fully evaluated
...

‘Premature over-interpretation’, ‘premature completion’: precise (from Latin *præ-cisus*) means ‘cut off before its time’? What this boils down to is that the left hemisphere specialises in jumping to conclusions. As a result, Goel emphasises that the misconception that the left hemisphere is dominant for reasoning and cognition in general must give way to ‘the importance of thinking in terms of hemispheric specialization’.²⁸⁷ When we come in Chapter 7 to look at cognitive intelligence, this will be amply confirmed.

What else discriminates the particular strengths of the two hemispheres? Bear in mind that the area is complex, the science young, and that conclusions must be tentative.

The psychologist and philosopher of cognition Philip Johnson-Laird foresaw right hemisphere participation in logical thinking before we had any scanning data to demonstrate it. This is because, he reasoned, the mind naturally solves problems *not* by working through rules in the abstract, but by imagining – sometimes a *visual* image, sometimes not. We construct a whole context, whether a scene or story, and see what it implies, whether it coheres in real-world terms, and seek alternatives if it doesn’t. ²⁸⁸ Several studies have shown that damage to the right hemisphere impairs not only patients’ ability to make logical inferences, as one might expect from the major role in interpreting human situations played by the right hemisphere, but to understand propositions involving *logical connectives*. For example, people without a properly functioning right hemisphere can still solve problems such as:

John is taller than Bill. Who is taller?

Arthur is taller than Bill. Bill is taller than Charles. Who is tallest?

But not:

John is taller than Bill. Who is shorter?

Arthur is taller than Bill. Bill is taller than Charles. Who is shortest? ²⁸⁹

In formal terminology, they have problems in deducing the ‘converse of relations’. In other words reversing relationships. It is tempting to think that this is largely because the problem is visualised – three men in a row – traditionally considered a strength of the right hemisphere; and there are indeed the expected reports of impaired reasoning on spatial relational problems by patients with right hemisphere damage.²⁹⁰ But right hemisphere reasoning can also be based on a scenario where the crucial piece of evidence is not only not visual, but has no perceptible correlate. For example, patients with right hemisphere damage find it hard to understand the following situation, and to make logical inferences about it:

1. Sally approached the movie star with pen and paper in hand.
2. She was writing an article about famous people's views about nuclear power.

Normal individuals are likely to infer that Sally wanted to ask the star about nuclear power; but patients with damage to the right hemisphere infer that Sally wanted the movie star's autograph.²⁹¹ They seize on the first sentence, make a quick and dirty inference, and then can't let go. Similarly, when shown moral choice scenarios,

split-brain patients' left hemispheres formed quick-and-dirty inferences when presented with initial evidence about the scenario (the potential danger of the situation), and these inferences were resistant to revision when additional evidence about the characters' intentions was provided.²⁹²

It is the left hemisphere that is adept at ‘prematurely locking onto precise concrete patterns, and quickly drawing conclusions, albeit substandard ones’.²⁹³

In fact deductive logic is significantly associated with an area best known for its role in emotion and feeling, the right ventromedial prefrontal

cortex.²⁹⁴ People with damage to this area can't see what other people intend, or what purposes they have. And seeing what follows from a social, emotional understanding of the situation in which one finds oneself in the real world is at least as important as seeing what follows from an abstract proposition. Indeed understandably enough, if a task involves arbitrary material, most people's performance is relatively poor. We are intentional beings with purposes. Our thoughts and actions have contexts and ends. So it is not surprising to learn that the presence of meaningful content dramatically improves that performance.²⁹⁵ This is well illustrated by the so-called Wason tests (discussed in Chapter 18).

For what it's worth, deductive reasoning can be broken down into at least three categories which, it has been suggested, may have differing brain correlates. Relational arguments (A is to the left of B; B is to the left of C; therefore A is to the left of C) require right hemisphere involvement. Categorical arguments (all As are Bs; all Bs are Cs; therefore all As are Cs) require left hemisphere involvement, as do propositional arguments (if there is an A, then there is a B; there is an A, therefore there is a B). All this is exactly what we would expect given the relational mode of the right hemisphere, and the categorising and linear, propositional mode of the left hemisphere. However this needs to be heavily qualified, in ways that make sense in the light of what we know of the overall approaches of the two hemispheres.²⁹⁶

For example, a hemisphere difference with which we are already familiar also plays a part: the left hemisphere's limited capacity to deal with what is not explicit. More explicit reasoning is underwritten by the left hemisphere, less explicit reasoning (such as is often involved in problem-solving, including scientific and mathematical problem-solving) by the right hemisphere. This is an important part of what we call 'insight', the ability to see suddenly to the core of a problem, when it is not obvious, and resolve it, a process often accompanied by an 'aha' moment. Such moments of insight are robustly associated with activity in the right amygdala, an ancient, deep-lying structure involved in emotional reactions, and the right anterior superior temporal gyrus.²⁹⁷ This kind of problem-solving may be impaired by too much consciousness of the process: rendering one's thought processes explicit, or analysing a judgment, encourages the left hemisphere's focus on the explicit, superficial structure of the problem, at the expense of its depth.²⁹⁸

Everyday problem-solving requires both hemispheres. A good example is deduction: some steps need to be followed (LH), but the solution may still come as a revelation (RH). A comparison of deduction with probabilistic reasoning found that 70% of the subjects noted sudden insight, an ‘aha’ moment, during deduction, while, by contrast, 80% described ‘probabilistic reasoning’, effectively induction, as involving ‘the gradual stabilisation of judgment’. Simultaneous brain scans revealed activation of the right amygdala (but not the left) in the deduction task, which relied predominantly on right hemisphere structures in this study, but no amygdala activation (either left or right) during the probability task.²⁹⁹

The extent to which the reasoning problem relies on interpreting syntax governs the degree to which the left hemisphere is involved – one problem with all the findings in this area is knowing how much of what seems to be a left hemisphere predominance is due to the often semantic-syntactic elements of the exercise that is being assessed.³⁰⁰ But, contrary to received opinion, much reasoning takes place outside language.³⁰¹ Thus, according to Ribeiro and colleagues, the right hemisphere is ‘the *main* region responsible’ for making logical or pragmatic inferences, particularly where the stimuli are visual rather than lexical.³⁰² There is a right hemisphere superiority for the detection and application of an underlying principle or pattern in the absence of verbal awareness (a common component of intelligence tests, and of the GCHQ aptitude tests). Thus, for example, where the colour of a number flashed on a screen predicts something about the number that follows, it is the right hemisphere that is better able to detect the rule. Indeed before we are aware of there being a rule or principle at all, the right hemisphere has clocked it.³⁰³

This is pattern recognition, at which the right hemisphere excels. It is also the basis of all scientific thought.³⁰⁴ And, outside of the world of puzzle books and psychological experiments, right frontal and temporal cortex play a critical role in understanding and inferring the true meaning in *context*, even where there is a key role for language.³⁰⁵

The left hemisphere language regions (including Broca’s and Wernicke’s areas) and parts of the prefrontal cortex have been repeatedly implicated in studies of inferencing.³⁰⁶ An unbridled tendency to draw inferences is one reason that the left hemisphere is far more open to delusion than the right, by a factor of about 3:1 (and that is, in all

probability, an understatement of the case). As Claude Braun and Sabrina Suffren have shown, it is not so much that there are perceptual or cognitive deficits after right hemisphere damage, though indeed there are, as that the unbridled cognitive propensities of the left hemisphere, specifically jumping to conclusions and excessive reference to the self, lead to delusional thinking.³⁰⁷

Reasoning and calculation are not the same thing. Regions in the *right* prefrontal cortex and inferior parietal lobe are more active for reasoning than for calculation, but regions in the *left* prefrontal cortex and superior parietal lobe are more active for calculation than for reasoning.³⁰⁸ This is partly because of the left hemisphere's being superior at multiplication, since it has ready access to the 'times tables', which are verbal recitations used in such calculations.

But there is a broader, and highly significant, underlying principle here. The left hemisphere is very good at carrying out procedures (calculation), less good at understanding the real-world meaning of the procedure. The right hemisphere not only encodes verbal stimuli more veridically than the left hemisphere:³⁰⁹ despite the clear general advantage for the left hemisphere in processing verbal material, the right hemisphere has the advantage in language *comprehension*. That might surprise you, until you realise that understanding requires retention and integration of different types of verbal information over long time spans, and the ability to revise as new words are encountered and integrated with the prior context. For lengthy sentences or paragraphs and longer discourses, this task becomes more difficult, as the amount of information that is extracted grows and as earlier material must be remembered, and perhaps reassessed over longer time intervals.³¹⁰ For a range of reasons, including having a longer working memory,³¹¹ more sustained attention, a better grasp of the whole, greater sensitivity to context, a greater capacity to understand implicit meaning, a greater degree of flexibility and willingness to revise assumptions, the right hemisphere has the advantage.³¹² The right ventrolateral prefrontal cortex is also important for monitoring whether an action is appropriate in context, and preventing it happen when it isn't.³¹³

Thus, to sum up, one can say the following with some degree of conviction. The left hemisphere has difficulty recasting the information given, or coping with incomplete or contradictory information. It jumps to

conclusions, fails to get the point of a story, fails to understand what is going on in someone else's mind, is unable 'to make implicit inferences establishing coherence, to grasp the force of indirect illocutions such as requests',³¹⁴ and thus to make logical inferences from what it is told. Where the circumstances are familiar, the problem is determinate and explicit, the situation is congruent with one's belief bias, and the presentation is lexical, there is a clear left hemisphere advantage in reasoning. But where the circumstances are unfamiliar, indeterminate or implicit, challenge one's bias, or are not expressed in primarily lexical terms – or require interpretation in the light of context – there will be a critical role for the right hemisphere.³¹⁵

Since the whole point of my exploration of reason is to see the extent to which it can be relied on for truth, let me finish with some further considerations on the topic.

According to Michael Gazzaniga, the left hemisphere 'is constantly looking for order and reason, even when there is none – which leads it continually to make mistakes. It tends to over-generalize, frequently constructing a potential past as opposed to a true one.'³¹⁶ My model, says the left hemisphere, is better than your reality: in the canonical, theoretical world of general abstractions, things should work out according to my plan. But then reality, with all its messy complexities and differences, gets in the way and spoils the story.

The left hemisphere is more likely to act on its theory as though it represented reality. A very important aspect of the real world is that in it nothing happens in isolation. Everything exists only in relation to an indescribably rich and complex nexus of other things, some of which modify whatever happens to be the 'target' of our attention by their very presence. Equally they will be changed by our intervention and, in turn, will change the nature and direction of the intervention itself. In other words there is never a truth without a context with which it interacts: there is a context for everything in the real world. In the theory that gets left out.

Part of the problem is the left hemisphere's reluctance to confess when it is nonplussed. Its self-belief is a problem: it believes its own propaganda. It often does the 'smart' thing – which is, in actuality, not as smart as it looks. As we know it hates uncertainty; and according to Gazzaniga's research team, 'the left hemisphere tends to create inferences and explanations to resolve uncertainty'. Meanwhile, as they put it, 'unlike the

left hemisphere, the right hemisphere, in our view, places a premium on the truth.’³¹⁷

For example, in a simple task requiring the participant to predict which of two stimuli will appear on a given trial, say a green light or a red light, the isolated left hemisphere of split-brain patients attempted to distribute its responses in a way that matched the probability with which each stimulus appeared. So if it seemed that red came up two-thirds of the time, it would randomly predict red on two-thirds of occasions and green on the other third. That may sound smart, but it’s illogical. You don’t know ahead of time which individual stimulus will be which, and you end up scoring at chance level. The correct solution is to choose red every time, since it is always more likely. And this is exactly what the right hemisphere does, thus maximising the number of correct responses.³¹⁸ This, interestingly, relates to the difference between a generalisation, something that is predictable (red 66%, green 33%), with which the left hemisphere deals; and a unique instance, which is therefore unpredictable (and is always either red or green, not 66% red and/or 33% green), with which the right hemisphere deals.

In another study, when the experimenters rigged things, so that, after a while, whatever guess the left hemisphere made it received the encouraging response that it had chosen correctly, it confidently asserted that that was because it had at long last cracked the formula.³¹⁹ Er – bullshit.

SUMMARY

Virtually all delusional syndromes are more commonly the result of right hemisphere than left hemisphere dysfunction; the degree to which this is the case is broadly proportional to the bizarre nature of the delusion involved; and no delusional syndrome is commoner in left than right hemisphere dysfunction. Insight into delusional thinking is dependent on the right hemisphere. In general, right hemisphere memory is more veridical than left hemisphere memory. Both hemispheres play a part in reasoning, and when the situation is relatively simple, completely specified and the outcome in accord with expectation, the left hemisphere plays the key role; when any of these conditions does not apply, the right hemisphere is more reliable and veridical.

Overall, in general it is the judgments on reality made by the right hemisphere that are more reliable.

APPREHENSION

Rushing into action, you fail. Trying to grasp things, you lose them.

—Lao Tzu ¹

WE'VE HEARD A LOT ABOUT WHAT HAPPENS AFTER RIGHT HEMISPHERE damage. But what happens after damage to the left hemisphere?

The twentieth-century psychiatrist Friedrich Rothschild wrote perceptively that the human body manifested

a difference, which constitutes an expression of the ultimate primordial fact of life, the opposition, the duality, or better the polarity, of the individual and the world. *The left side of the body serves more as the place of receptivity and action for whatever is other than ourselves, the right side serves more those active life expressions that emerge from one's individual self.* The polarity of individual and cosmos has its counterpart in the polarity of right and left; that is the meaning we believe we can see in the structure of the body.²

Thus, he thought, while the right hemisphere responds to the realm of the world beyond the self, the left hemisphere expresses the will of the ego acting on the world. And since, as we have seen, the key advance of the left hemisphere in humans was to enable us to manipulate the world vastly more effectively than other animals, the consequences of damage should

largely have to do with our capacity for *utilisation*. In the left hemisphere this could be said to be *ap-prehending* (from Latin *ad* + *prehendere*, to hold *onto*) the world, and in the right *com-prehending* (from *cum* + *prehendere*, to hold *together*) the world.

Speech arose in humans in an area of the left frontal cortex, called Broca's area, which lies just next to the area that controls movement of the right hand. Indeed it is widely thought that language developed, in part, from gesture. This speech area has been found to be activated even by grasp and manipulation, and is constantly involved in the production of meaningful gestures.³ Equally, restricting hand movements impairs verbal fluency.⁴ Speech and pointing develop together in infants: the child 'always points while naming and does not name without pointing – stretching out the right hand', according to Marcel Kinsbourne.⁵ Most remarkable of all, as mentioned, patients born without arms can nonetheless experience phantom upper limbs; VS Ramachandran describes the case of just such a woman who experienced uncontrollable gesticulation by her phantom limbs.⁶ Once again, it looks as if there must be some morphogenetic schema that is innate. Detailed phantom limbs are not infrequently reported by people born without limbs.

In most languages, the words we use to describe language processes derive from the right hand: we say we 'grasp' the meaning, and so on.⁷ The connexion lies deep in our minds and in our brains. What would be the likely consequences of a left hemisphere stroke or other insult? In the first instance, this would be an impairment of utilisation, by means of the right hand; and in the second, of utilisation through language, which yields a virtual, easily manipulated, version of the world in which we can test out possible strategies and issue instructions. Language and the hand turn out to have a lot more in common than just being next-door neighbours in the brain. In left hemisphere damage, the two most serious consequences are motor impairments, particularly of the right arm and hand; and language impairments.

Let's begin with the right hand. Problems with the hand are not just those of damage to the left primary motor cortex itself causing difficulty moving the right hand and arm, in exactly the same way that damage to the right motor cortex causes difficulty moving the left hand and arm. I am referring to something *cognitive*, over and above the motor level, to do with readily usable daily objects, such as tools.

One of the first detailed descriptions is by the great Czech neurologist, Arnold Pick, over a hundred years ago. His patient Salamoun, who had suffered a left hemisphere stroke, had problems using simple everyday objects such as matches, keys, a hammer, or a razor. Here he is, trying to light a pipe:

The patient is given a pipe and brings it correctly to his mouth, then expertly reaches for the tobacco pouch and takes a match from the box but when asked to light it, sticks the head of the match into the mouth piece and puts the other end in his mouth as if to smoke it. Then he takes it out of his mouth, draws it out of the mouth piece and sticks the *other* end of the match in the mouth piece of the pipe, pulls it out again, holds it for a while in his hand apparently thinking, and then puts it away.⁸

Intriguing. Notice that Salamoun is not generally cack-handed: he goes through a sequence of actions fluently, even ‘expertly’, up to a certain point. He understands what he needs and wants to do, and he gets as far as actually taking the match in his hand – then is suddenly lost. But it is not that the sequence that leads up to it is more practised than the striking of the match itself: in fact the striking of the match is probably the most practised and automatic action of all. Yet it is the *use* of the match that stumps him.

Another patient, described by the French physician Joseph Morlaas, showed related problems:

For example, we give the patient a pair of scissors; she says ‘scissors’ correctly [ie she recognises the object, knows, in the normal sense, what it is]. We ask her to write, and she uses the scissors as a pen and is amazed that no letter can be seen.

Morlaas called it *l’agnosie d’utilisation*, a not knowing how to *use* objects.⁹ Nowadays this is usually called ‘ideomotor apraxia’, and it is a frequent consequence of damage to the left parietal or premotor areas. It is characterised by an inability, on command, to carry out a simple action in relation to an object of use – a comb, a toothbrush or a hammer, for example – or to imitate its use, though the action can usually be carried out

spontaneously (ie, when conscious will is less involved). Such damage renders the sufferer incapable of using a hammer and nail, or a key and a padlock, a match or a pair of scissors, at least when consciously obliged to do so, whereas right hemisphere damage leaves the ability to use simple tools unaltered.

By contrast, difficulty in conceiving a task as a whole, usually involving a succession of processes, is called 'ideational apraxia', and it can occur after left, right or bilateral lesions.¹⁰ Right hemisphere damage only rarely impairs tool use, but is often involved where there is difficulty with a naturalistic action involving a sequence of steps – for example, making a cup of coffee, or wrapping a present, which are not so much about how to use an object as how to achieve an end.¹¹ Other apraxias, such as involve getting dressed ('dressing apraxia', a three-dimensional spatial task relating to the body) or construction ('constructional apraxia', putting together the parts of an object to build a whole, or drawing an object in space), are usually associated, as one might expect, with lesions in the right hemisphere, not the left.

I have suggested that the division of the brain arises from the need to attend in two radically distinct ways to the world at once. This can be seen, once again, in the human hand.

When the movements of the right hand are no longer inhibited by the left frontal cortex, it can't be prevented from making random grasping actions. Following loss of inhibitory control through stroke – what is known as a 'release' phenomenon – one woman found that her right hand would tend spontaneously to reach out and grasp objects (eg, door knobs) that she passed; in another case the hand would randomly pick up a pencil and start writing.¹² A right-handed patient who had suffered infarction of the left medial frontal cortex had troublesome spontaneous grasping which he could no longer inhibit.¹³ Another, again after a left frontal stroke, found her right hand

showed an uncontrollable tendency to reach out and take hold of objects and then be unable to release them. The patient would repeatedly express astonishment at these actions. At times the right hand interfered with tasks being performed by the left hand, and she

attempted to restrain it by wedging it between her legs or by holding or slapping it with the left hand. ¹⁴

It is the left hemisphere that controls the right hand, which, for most of us, is the one that grasps things, and when frontal control is lost, the right hand grasps automatically and at random. This is true in left-handers, too – the concept of grasping is separate, therefore, from control of the hand as such. ¹⁵

By contrast, the concern of the right hemisphere is exploration, not grasp. In a mirror image of the finding just referred to, exploration of space, even with the right hand in a right-hander, extraordinarily enough specifically elicits activity in the *right* hemisphere. That it is the *exploratory nature of the action* which matters is made clear by contrasting grasp and exploration. During grasp, activations occur as expected, in the left hemisphere. Strikingly, however, ‘during exploratory movements [still of the right hand]... all areas of activation were in the *right* hemisphere’, despite this being on the same side as the hand being used and the area of space being explored. ¹⁶ And this finding is not confined to humans: when great apes, and monkeys, want to utilise inanimate objects, they reach out with the right hand (left hemisphere). Yet they reach out the left hand (right hemisphere) towards living things. ¹⁷

Here we see a radical distinction between the hemispheres: in the right hemisphere, exploring the world, on a level with it; versus seizing hold, and taking control, of the world, in the left. The right prefrontal cortex is in fact essential to meaningful exploration. ¹⁸

So much for the hand. But what about language, that huge, and hugely important, area in which left hemisphere damage is principally manifested, whether in its reception or expression, oral or written? What is language, after all?

The nature and purpose of language is a large topic, and my thoughts on the subject have been elaborated elsewhere. ¹⁹ In *The Master and his Emissary* I argued that language is neither necessary for communication – not even for some highly sophisticated kinds of communication; nor for thinking – not even for some highly sophisticated kinds of thinking; although, since we have it, it is clearly involved in some aspects of both.

I also discussed the position held by many prominent anthropologists, going back to Herder and Rousseau in the eighteenth century, and echoed by von Humboldt and Jespersen, in the nineteenth and twentieth, that to the extent that language is used for communication it probably began as a form of music, deeply rooted in emotion and the body – the most expressive aspects of language still are its ‘musical’ qualities, pitch variations, intonation, rhythm, speed, volume and flow; and that it approximated the rather more abstract and symbolic nature of language as we now know it by degrees, beginning in the right hemisphere, as language still does in children, and gradually crossing to the left hemisphere, leaving music behind in the regions of the right hemisphere that are homologous to the ‘language areas’ of the left. My own view is that formal language was required, possibly as an effect of the increasing size of social groups, only when I–Thou relationships ceded gradually to I–It relationships. It enabled ‘me’ to communicate with ‘you’ not just about ‘us’, but about an object or third party, ‘over there’ or currently not present, on which, or on whom, we might have designs.

But another way of thinking suggests that language may not be about communication, primarily, at all. It may instead be a way of mapping the world – a system of symbols that reflects the world. Words, according to this view, are tokens for things, and grammar a schema of how they relate, enabling us to plan a strategy and manipulate more effectively. As a map enables us to see things that just living headlong ‘at ground level’ would never allow us to see, so language, the manipulation of those symbols, enables us to see, as if ‘from above’, what the overwhelming impact of immediate experience hides from us. It enables alternative hypotheses to be compared and examined for their projected consequences. We can, for the first time, go ‘offline’ and play with the shapes. I have compared the left hemisphere’s use of language to a general’s strategic campaign map of the *territory*, which has the important facts for the purpose clearly flagged, but leaves out almost everything of the reality in the *terrain* it maps. In a map, that is not a weakness, but precisely the source of its strength and usefulness.

Of course, the analogy of language with a map goes only so far. Language is a highly complex system, a constantly emerging, and evolving, organism, an embodied aspect of experience, caught up in the fluidity of the reality it reflects. And from the commerce between symbols and what they

symbolise two things inevitably follow. In the left hemisphere's world words are seen as arbitrary signs: in the right hemisphere's world they are seen as to some extent fused with the aspect of reality they represent.

In other words, tokens or symbols cannot escape being part of the real world in the right hemisphere, and the real world cannot escape becoming tokens or symbols in the left hemisphere. Thus subjects with their left hemisphere experimentally suppressed reported that the sun was so named 'because it shines', bread because it is 'so tasty and fresh', spaghetti because it's 'what you eat with cheese'. They couldn't accept that objects might be renamed; the name was part of what they *were*. By contrast, with the right hemisphere suppressed, subjects took the view that names are entirely arbitrary.²⁰ (Although de Saussure taught that the sign is arbitrary, it is not.)²¹

Incidentally, there is a fascinating passage in Hugo Karl Liepmann's account of his patient T, a 48 year-old government official who suffered a stroke, resulting in damage to higher cognitive centres in the left hemisphere, and a release phenomenon in the right hand. Liepmann records this 'remarkable fact':

When required to indicate objects in a picture, he points correctly with the left hand but frequently moves the right hand as if he wanted to grasp the pictured object. He attempts in a way to take it from the sheet. His behaviour is as if he had the illusion that the pictured object was physically real.²²

This patient simultaneously exhibits an *increase in the sense of reality* of what is merely a representation, due to left hemisphere damage, and the grasp reflex of the right hand.

According to a view which has been much promulgated in recent years, language is just a system of signs, in which words refer endlessly to one another (a typical left hemisphere view). However language is ultimately like another token system, money. Its value cannot lie purely in referring to itself. Money means something only in terms of an underlying reality: it begins with real-world items – someone's cows, hens or corn somewhere – and eventually it is returned to real-world items – groceries, car repairs or cinema tickets – somewhere else, however many 'virtual' transactions it

may become involved in along the way. According to the narrow view and the short-term view that characterises the approach of the left hemisphere, money appears to have value in itself, to be an end in itself. But from the broader, long-term view that characterises the approach of the right hemisphere, this is clearly a mistake.

So it is with language. All language is metaphoric in nature. All meaning eventually arises from personal experience in the body; and language – including, and especially clearly, philosophical and scientific language – metaphorises bodily experience, however *abstract* (literally ‘dragged away’) its *discourse* (literally ‘running to and fro’) may appear. It is metaphor alone (the word itself is a metaphor: it means one that ‘carries across’) that can carry us across the apparent gap between language and the real lived world. The meaning of language begins and ends in the body – where it ‘cashes out’ in experience.

As I have suggested language, like everything else, has its left hemisphere aspects and its right hemisphere aspects. It is to be expected that these will reflect the nature of the two hemispheres’ worlds – and they do. There are three aspects of language that especially tether language to the lived world and to the body: metaphor, ‘prosody’ (the music of the voice, its inflection and intonation) and ‘pragmatics’ (the understanding of an utterance as a whole in its real-world context). All three are primarily right hemisphere-dependent. Perceptual links between words – another ‘real-world’ element – are also made primarily by the right hemisphere.²³ By contrast semantics and syntax – the tokens as such and the internally validating rules whereby they relate, within the system – are primarily (though not exclusively) left hemisphere-dependent.

The left hemisphere has a much more extensive vocabulary than the right, and more subtle and complex syntax. It extends vastly our power to map the world and to explore the complexities of the causal relationships between things. This is surely its *raison d’être*, and it is valuable to a predator, at least in simple circumstances, where there are not many factors, as there almost always are once one starts taking the broader view.

But this superiority has nothing to do with a greater affinity in the left hemisphere for language *per se* – with words or auditory material. Rather the left hemisphere’s superiority for language stems from its being the hemisphere of *representation*, in which *signs are substituted for experience*.

You might imagine that the usual right hemisphere predominance for recognition of facial expressions should also apply to lip-reading. But not at all.²⁴ Equally you could be forgiven for thinking that sign language, which is visuo-spatial rather than verbal in nature, had an affinity with the right hemisphere, rather than the left. But sign language, just like verbal language, is left hemisphere mediated;²⁵ and left hemisphere damage in just the areas that cause problems for hearing subjects causes disruption in sign language for deaf subjects.²⁶ This proves that the specialisation of what is called the ‘auditory cortex’ of the left hemisphere is not to do primarily with the processing of auditory material, or even of words as such. It is to do with the processing of signs, tokens, *representations* of things, whether these be verbal or visuo-spatial. This also, by the way, explains the otherwise baffling expansion of the so-called ‘language’ areas in the brains of primates, who nonetheless cannot be taught language: they begin the process of mapping the world in signs or symbols.

Equally, I believe, the visuo-spatial superiority of the right hemisphere is probably not about visuo-spatial qualities in themselves, but simply that vision has become the most important of the human senses, and is by now for most of us the main means of perception of the actual, of things *present in and of themselves* (in as much as such a thing is still possible) as opposed to their signs.

Apart from a range of problems purely to do with language and with the right hand, there are two syndromes that occur typically after left, rather than right, hemisphere damage.

One is called Gerstmann’s syndrome. Its very existence is controversial and it was famously described by AL Benton as ‘an artefact of defective and biased observation having little support for its alleged focal diagnostic significance’, before being trenchantly critiqued by the formidable Macdonald Critchley a few years later.²⁷ However, what concerns us is not whether it constitutes a syndrome (it may or may not), but whether its posited constituent parts are common consequences of left, rather than right, hemisphere damage – which they indisputably are.

What are they? There are four elements: difficulties with writing (dysgraphia), with calculating (dyscalculia), and with right–left orientation, together with difficulty identifying one’s fingers by name (finger agnosia). Let’s look at them in turn.

Difficulty writing, given the manifest problems in left hemisphere stroke of language and using the right hand, can hardly count as a surprise; nor can difficulty calculating, since we have established that certain types of calculation, or symbol manipulation, are the sort of thing we expect the left hemisphere to provide under normal circumstances – particularly multiplication, which relies on implicit recitation of the ‘times tables’. As for right–left disorientation, when formally tested under optimal conditions, a random sample of medical students were right–left disorientated 23% of the time, which accords with other figures suggesting that about 20–25% of the general population is right–left disorientated much of the time.²⁸ No other part of a neurological syndrome has such a high hit-rate among the normal population, and it can be reasonably doubted whether it could act as a diagnostic criterion for anything. In any case, this is almost certainly a problem in labelling, or naming – in other words, a linguistic, or at the very least a symbolic, problem.²⁹

Which leaves the question of difficulty naming one’s fingers, or recognising and responding to them by name – so-called finger agnosia. And that, in turn, leads neatly into the second syndrome (other than Gerstmann’s syndrome, if it exists) which is almost always identified with left hemisphere damage.³⁰ It will be remembered that, though the left hemisphere does not have a good sense of the body as an integrated entity, it does have dominion over the body as an assemblage of parts. This explains a condition called autotopagnosia (from Greek, *auto-*, self, + *topos*, place, + *gnosis*, knowledge) sometimes also called, especially in the Spanish literature, ‘autotopoagnosia’. The term refers to an inability to locate, on demand, body parts either on one’s own body, or on another body, or in a picture, when they are named by an examiner. It seems to follow damage to the left posterior parietal cortex, or underlying subcortical regions.³¹

The condition manifests itself not spontaneously but in response to questioning. In ordinary conversation, subjects use the names of body parts appropriately. For example, a man who could not point to his ankle on demand, later remarked spontaneously, ‘I always told my sons not to play football, since sooner or later they would break their ankles’.³² It is when asked to name or to point to a body part in response to its name that the condition becomes apparent. The most frequent errors are pointing to a body part next to the one intended, or to one semantically related to it. The

deficit is in naming and in describing the functions of body parts, or in determining their spatial relationships.³³ It has generally been attributed either to a linguistic impairment, or to the inability to analyse a whole into its parts, or both. Here is one of the most striking examples reported in the literature:

'Where is the mouth?' 'The mouth is in the upper half of the body; it is the seat of speech ...' *'Is it above or below the nose?'* 'Well ... it is difficult to say exactly ... this is the kind of thing that slips my memory.' *'Above or below?'* 'I would say above, but I am not sure.' ... The finding, however, that the patient failed not only in pointing to body parts, but also in pointing to parts of a bicycle, strongly argues against [the assumption that it concerns only the body] and indicates that the disorder extends well beyond the realm of awareness of the human body... The hypothesis is, therefore, advanced that the basic disturbance was the inability to analyse a whole into its parts... ³⁴

Nonetheless, two other cases suggest that the problem is commonly limited to body parts.³⁵ And, from a much earlier case, from Gottfried Engerth in the 1930s, one sees very clearly preserved overall form, coupled with impairment of parts:

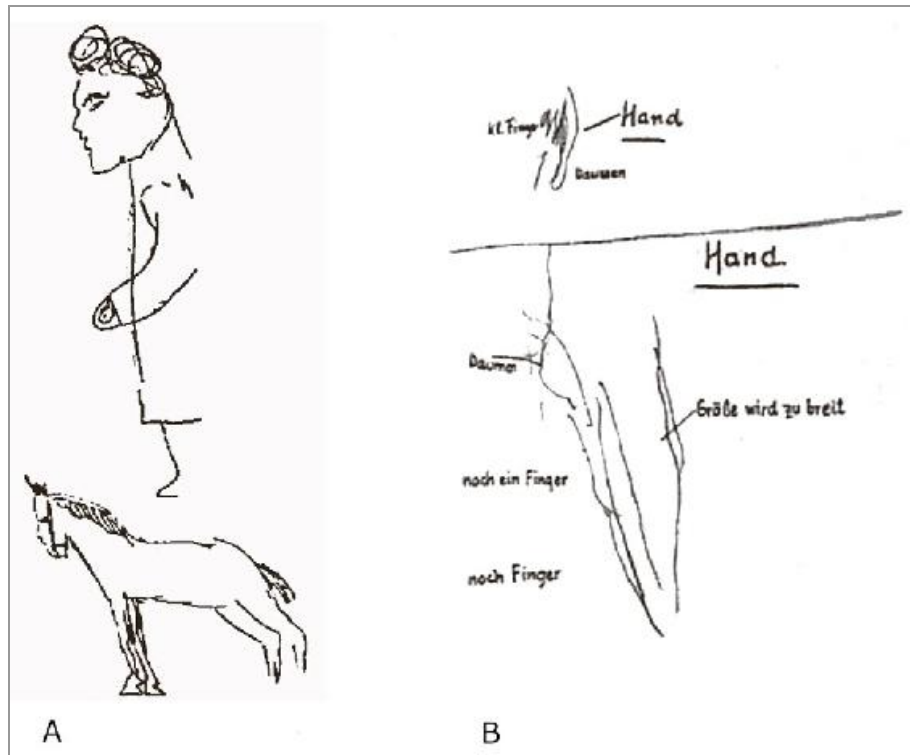


Fig. 16. Drawings of (a) a person, a horse and (b) a hand, by a subject with autotopagnosia (from Engerth 1933)

As you can see (fig a), the subject is able to draw the idea of a horse and a person (though there is some element of right visual field hemineglect, interestingly enough, in both), especially when you consider that he is using his unaccustomed hand to draw. But his attempt to draw a hand is hopeless (fig b). Notice that it is the *hand* in particular – as one can also see from the fact that the person (fig a) has an arm that ends in something like a wheel, not a hand (and perhaps that the horse’s hind hoofs are neglected).³⁶

When the left hemisphere is damaged, the representational system of language may fail, with potentially devastating consequences for someone living in a culture where the word is all-important. But the things that are represented are still there, of course, and can often be summoned to the mind by the word: it is usually extracting the word from memory and uttering it that seems to present the problem. Joseph Lange describes a woman with alexia, inability to read, following a stroke: what is so arresting is that though the word is lost, the real-world referent shines through. The import of the word has been understood, though it itself can be recovered only with huge difficulty. Instead of reading ‘India’ she reads ‘elephant’;

instead of 'Reichstag' she reads 'Berlin' – and carries on to describe the scene at the Reichstag. In other words at the implicit level she has understood the significance of the word, but she can't read it. Similarly:

At first she cannot read the word Goethe but states, 'It is a man, a poet, I know but I can't name him. Uhland – no, not Uhland, he belongs in the Biedermeier period.' She then spells G, a, l, and then stops while spelling and calls out liberated, 'It is Goethe!' ³⁷

This is just more evidence that human hemisphere difference could be seen as that between the experienced world (right hemisphere) and the virtual world (left hemisphere). The left hemisphere's strength in humans, because of the development of the frontal lobes, has become this: given data, it can manipulate it in certain ways highly efficiently. But it isn't good, any longer, at understanding what the data mean in real-world terms, a fact demonstrated by its tenuous hold on reality when the right hemisphere is no longer fully functioning, as we have seen, and shall further see.

Just as it is the right hemisphere that understands the overall meaning of an utterance, taken as a whole, while the left hemisphere has a better grasp of the rule book of grammar, it is, perhaps surprisingly to some, the right hemisphere that has the better intuitive sense of numbers and their relative size.³⁸ However, the sense is approximate. By contrast, the left hemisphere has precision, but it lacks the same intuitive sense of what it is actually doing, other than following rules and manipulating symbols.³⁹

SUMMARY

Left hemisphere dysfunction does not change the world radically in the way that right hemisphere dysfunction does. Rather, it presents impediments to fluent utilisation of the world, either through the right hand or through language: the problem is not one of understanding (*comprehension*), but of manipulating (*apprehension*), the world. The fabric of reality typically goes for the most part unaltered when the left hemisphere is suppressed.

EMOTIONAL AND SOCIAL INTELLIGENCE

Anyone who wants to be all head is as much a monster as one who wants to be all heart.

—*Johann Gottfried Herder*¹

AS I WRITE, AN ‘IN DEPTH’ SURVEY OF RIGHT HEMISPHERE FUNCTIONS confirms, if confirmation were needed, the drift of the previous chapters: that the right hemisphere’s mode of attention, capacity for pragmatic understanding and communication, superior perceptual integration, and ability to shift belief appropriately in the light of new evidence, all make possible what the authors refer to as the ‘right hemisphere-dominated grip on reality’, a grip that ‘becomes increasingly tenuous the more impaired these functions become’.²

What we have not yet talked about, however, is the intuitive sense of reality itself, and the impact of emotional awareness on the capacity to understand what is happening in the world. If the left hemisphere, as we will see Jaak Panksepp suggests, tends to lie about emotional matters, it may be, as much as anything, because it simply does not understand what it is dealing with. But I don’t discount Panksepp’s hint that there may be more to it than that.

THE SENSE OF REALITY

It would be hardly surprising if abnormal activity or deficits, regardless of hemisphere, were to lead to changes in something so hard to pin down as the sense of reality itself. However, there are several indications that such phenomena are more common when there are abnormalities in the right hemisphere.

The first thing that springs to mind is that some patients who actually report a diminished 'sense of reality' have impairments of function predominantly in the right hemisphere,³ show cortical thinning in various regions in the right hemisphere,⁴ and exhibit grey matter volume reductions in the right hemisphere, together with volume increases mainly in the left hemisphere.⁵

A diminished sense of reality is a very common experience in schizophrenia, a syndrome that, as I have suggested, closely resembles aspects of a right hemisphere deficit syndrome. It can be so pervasive that patients believe that nothing is real, all is play-acting. In hospital, patients often believe that the doctors and nurses are actors, the ward is a stage set, everything a *representation* of reality, not reality itself. This has some elements in common with Capgras syndrome, in which familiar people have been replaced by impostors, a syndrome almost always involving dysfunction in the right temporoparietal region, as we have seen.

Additionally, borderline personality disorder, in which there is a grossly diminished sense of the self and of the reality of the external world, is related to reduced size of the right parietal lobe, and enlargement of the left hemisphere in the region of the postcentral gyrus.⁶ Elevated levels of perfusion in the left temporal lobe are found in the closely related, indeed overlapping, condition of dissociative identity disorder.⁷ A patient with borderline personality disorder marked by severe self-mutilation, sense of futility and tendency to manipulate others ceased to exhibit the symptoms after a left frontotemporal injury sustained in a suicide attempt.⁸ A study of a patient with the rare Kleine-Levin syndrome, in whom the primary disturbance was a pervasive sense of unreality, implicated deficits in the right hemisphere.⁹

Lesions that give rise to epileptic phenomena are a special case. This is because it is difficult to know if dysfunction of brain tissue leads to a diminution, or its excitability to an exaggeration, of the experience with which that cortical area is commonly associated: either can occur.¹⁰

Be that as it may, EEG measures and electrodermal response amplitudes and frequencies show greater activity in the left hemisphere in schizophrenia compared to normal subjects. (As expected, the reverse picture is found in depression, with greater activity in the right hemisphere and lower in the left hemisphere than in normal subjects.)¹¹ This is in keeping with the phenomenological picture in schizophrenia, which resembles one of abnormal and exaggerated left hemisphere function. Similarly, looking at it the other way round, left hemisphere epileptic discharges produce schizophrenic-like psychotic symptoms.¹² Here is evidence to suggest that abnormal electrical activity intensifies the experience associated with the cortex. But in other cases the spontaneous excitability of the cortex is itself a sign that the underlying cortex is damaged and incapable of functioning normally.

For this reason, intriguing as these particular cases are, it is often hard to know how to interpret them with any confidence, although other evidence can sometimes point to the more likely explanation in any one case. In the sequence of perioperative cases referred to earlier, Mullan & Penfield describe two people who experienced what the authors call 'illusions of greater awareness', or a heightened sense of reality. Both had right hemisphere lesions: in one case it appeared to involve paroxysmal excitation of the right hemisphere, and in fact it is recorded that artificial stimulation, at operation, of the affected area gave rise in the patient to the sense of intensified awareness, making the interpretation of this case more straightforward. By stimulating the right hemisphere, the patient had a heightened sense of 'smells, sounds, visible objects, and pressures'. He called it 'new awareness' of whatever he was experiencing, whether it was his own backyard or simply cigarette smoke. He had previously experienced the same thing at a cinema when, as he walked out, he was 'unusually conscious of the weight of his coat and of the weight of his feet upon the floor'.¹³ This is something like the 'presencing' associated with the right hemisphere, and with mindfulness, which is also independently associated with the right hemisphere. In the other case, no further details are given, so it might or might not count against the argument.

As to the opposite sense, a feeling of unreality, Mullan and Penfield mention 10 cases involving ‘strangeness, change or unreality’. Unfortunately, the unsystematic way in which the cases are reported makes it impossible to draw firm conclusions: on seven of the cases there are no details, and the authors do not distinguish adequately between feelings of unfamiliarity, or things being altered, on the one hand, and a sense of unreality as such, on the other. Two cases in which subjects felt ‘detached’ and that the world was ‘unreal’ involved excitation in the *left* hemisphere. The only other series that reports diminutions in the sense of reality associated with lateralised epileptic foci found that the majority were in the left hemisphere, which would support this interpretation.¹⁴ However, the data do not permit a clear-cut conclusion.

As we saw earlier, damage to the left hemisphere is markedly less likely to cause distortions of reality than damage to the right hemisphere, but it cannot be excluded from the picture altogether. The only two cases of left hemisphere lesions that involved more than a disturbance of visual angle in Cutting’s systematic review of almost 200 cases concerned what he calls a change in ‘emotional value’: in both cases left hemisphere impairment involved an increase in intensity of experience. In one of these cases, reported by Howard Cushing in 1922, there was an ‘exaggeration of his special sense impressions, i.e., flowers become extraordinarily beautiful, odours are intensified, his vision appears to be remarkably keen, so that objects seem to be increased in size’; this involved a glioma of the left temporal lobe and a consequent right-sided visual field defect.¹⁵ In the other case, reported by Macdonald Critchley in 1951, he states that the side of the lesion was unverified, although he thought it was more likely to be left-sided: during what sound clinically like complex partial seizures ‘one of the chessmen, his opponent’s knight ... for about half a minute seemed distorted – the pieces seemed to stand out more clearly, and the carving seemed deeper and more attractive.’¹⁶ Sadly, once again, we cannot be completely sure how to interpret these two cases; the first probably involves a release of the right hemisphere, the second an excitation of the left.

There are fortunately quite detailed first-hand accounts by individuals whose sense impressions were unusually vivid following left hemisphere damage. This is clearly described by Jill Bolte Taylor following her stroke; but also, for example, by a pilot, Stephen McKinnell, who also suffered a left hemisphere stroke, who found his visual perception abnormally clear:

I remember my attention to the tiny birds that were busy flitting among the dense dark green bushes in front of the car. It was like I was seeing them in a new light ... [And, on another occasion] I felt fantastic seeing the trees and the sunshine. Like my experience watching the birds, I felt that I was seeing them through different, more 'seeing' eyes.¹⁷

That would also accord with more recent cases of the converse phenomenon, *unreality* following *right* hemisphere lesions, such as a man with right posterior white matter tract disruption who reported that his surroundings did not 'feel real', which he attributed to a sense of emotional disconnectedness from his visual perceptions.¹⁸ And since, as we shall see, emotional connectedness is highly dependent on right hemisphere function, and the sense of reality on emotional connectedness, it seems reasonable to assume that left hemisphere damage might increase, and right hemisphere damage decrease, the sense of reality.

Worth including here is the phenomenon of *déjà vu*, as an anomalous experience of reality. Abnormal electrical activity in the right hemisphere should lead to an excess of the feeling of 'unique' familiarity – or its loss altogether, depending on whether the result is the exaggeration or diminution of the right hemisphere's characteristic mode of being. Yes, it's '*déjà vu* all over again': or its converse, *jamaïs vu*, 'never before seen'. And indeed both of these phenomena usually result from right hemisphere disturbance, rather than left – unless in left-handers.¹⁹ According to Cutting, there are 30 right-sided cases and seven left-sided cases in the literature to 2011.²⁰ If one includes cases of *déjà vécu* ('already experienced'), a similar phenomenon,²¹ the figure becomes 45 right-sided to seven left-sided.²² A study of 27 subjects revealed that '*déjà vu* episodes in patients began with polyspike activity in the right temporal lobe and, in some cases, ended with the slow-wave theta-delta activity in the right hemisphere'.²³ One man had the curious belief that he had lived the same part of his life over and over again (*identidem*): he had an epileptogenic focus in the right temporal lobe.²⁴ By contrast, one paper and a case report suggest a possible association between *déjà vu* and left temporal pathology.²⁵

There are more straightforward criteria of being in touch with reality. What can we say about the left hemisphere's capacity to understand the world in terms of its human content? Here, too, being less in touch with reality as it is perceived, less in touch with the body and the implicit, jumping to conclusions and being unable to shift mindset, is not a good start. But there are other, essential, factors in having a solid understanding of human reality which the left hemisphere seems not to 'get': the emotional import of human behaviour. Oliver Sacks writes that 'one cannot lie to an aphasiac'. Such a patient may not understand language, and so is not deceived by it, but instead 'grasps with infallible precision ... the total, spontaneous, involuntary expressiveness which can never be simulated or faked, as words alone can, too easily.'²⁶

In the film *The Divided Brain*, Jill Bolte Taylor even suggests that people with left hemisphere strokes should be employed as lie-detectors.

CONNECTING WITH OTHERS

We noted earlier the rather odd emotional state of Zingerle's patients – a striking detachment or lack of concern, which is typical of patients with right hemisphere dysfunction. Although it is true that the right hemisphere is far more involved than the left in emotional expressivity and receptivity – picking up other people's feelings and sympathising or empathising – it is absolutely not the case that the right hemisphere is 'emotional' and the left hemisphere 'cool' and rational. Anger, for example, an emotion not noted for its empathic nature, is one of the most strongly lateralised of all emotions, and it lateralises to the left.²⁷ Irritability and elation (when pathological, the cardinal signs of mania) are also more left- than right-lateralised, and associated with the left frontal pole, while sadness and melancholy (when pathological, associated with depression) seem to be associated with the right frontal pole, which is also the seat of empathy and social emotions.²⁸ A capacity for sadness is highly correlated with a capacity for empathy;²⁹ and conversely those who lack empathy, such as psychopaths, have difficulty recognising expressions of sadness in face or voice.³⁰ In turn, a capacity for sadness and empathy together is necessary in order to experience the socially vital feelings of guilt, shame and responsibility.³¹ People with right hemisphere damage tend to be impaired not just in emotional expression and interpretation, but may suffer a general loss of emotional depth.³² The eleventh-century Persian physician and polymath Avicenna (Ibn Sina) observed that melancholics have 'a multitude of wrinkles on the left side',³³ which may have been an astute observation that the left hemiface is more emotionally responsive and expressive, and that those who are more empathically engaged are more prone to melancholy.³⁴ Anger alone of emotions is more expressed in the right hemiface.³⁵

Some form of fellow-feeling in animals is ancient, and so is its association with the right hemisphere. Additionally we know that, when homing, pigeons fly so as to keep their favourite partners to the left, where they can be monitored by the right hemisphere, and pigeons observe visual cues from a given conspecific more closely with their left eye, and are more responsive to what is seen to their left.³⁶ By contrast, birds' *territorial*

behaviour is right eye (LH) dominated.³⁷ Similarly, male fish show more sexually motivated behaviour using their right eye (LH), females with the left eye (RH); and both generally more affiliative behaviour with their left eye (RH).³⁸ Bottlenose dolphins tend to stroke other dolphins more with their left flipper, and keep their preferred conspecifics to the left.³⁹ At the most primal level, the empathically connected right hemisphere prefers to keep what it guards to its left: creatures as various as whales,⁴⁰ walruses and flying foxes prefer to keep their young to the left of them,⁴¹ a tendency I have had occasion also to observe with ewes and their lambs.

The relationship between the two hemispheres is, as always, not symmetrical. Research in birds shows that the right hemisphere is generally ‘in control of behaviour’: the performance of normal chicks and experimentally induced left-eye-only (‘right hemisphere’) chicks is usually indistinguishable; not so in the case of right-eye-only (‘left hemisphere’) chicks.⁴²

Theory of mind

There is something which is misleadingly called ‘theory of mind’ (ToM) in the psychological literature – misleadingly, because it is not a theory, nor does it involve holding a theory, and concerns only one aspect of mind. It is the capacity to put yourself in someone else’s position, see what they see, and feel some of what they feel. Part of it is a matter of cognition – having the theoretical awareness that the contents of others’ minds differ from one’s own; and part is a matter of empathy – feeling one’s way into another’s mind. This is a huge topic with a commensurately large literature. In brief, it used to be thought that ToM was unique to human beings, and that even humans did not develop it till the age of about four (many people with autism never develop it, at least in the fullest sense). We now know that at least the cognitive aspect, and in many cases it may be much more than this, is present in animals as various as elephants, apes and dogs, whales and dolphins, crows and magpies, goats and seals, and that it is therefore much more widespread than we imagine.⁴³ It may also be that children develop at least a rudimentary form of ToM much earlier than we thought, by about 18 months or even earlier.⁴⁴

The classic test for ToM is called the Sally-Anne test.⁴⁵ Two dolls, Sally and Anne, are seen playing with a marble. When they finish playing, Sally puts the marble away in a basket, and leaves the room. Anne is then seen to remove the marble from the basket and put it in a box. The question is, ‘where will Sally look for the marble when she comes back?’ Normally we would say ‘in the basket’, because we know that that is where *she* thinks it is. Young children and those with autism reply ‘in the box’, because that is where *they* know it is.

There is a fascinating piece of research which is open to the interpretation that some right hemisphere damaged patients can’t tell the difference between the realm of thought and reality, and may even transpose them.⁴⁶ In the Sally-Anne test they answer like autistic subjects, indicating where they know the marble to be, not where Sally thinks it is. Then when asked where the ball *really* is, they switch – at precisely the wrong moment – to where Sally thinks it is. At the least it would be fair to say that they don’t have a firm grip on what another mind is thinking.

In general, empathy is highly dependent on right, especially right frontal, function.⁴⁷ Many recent studies suggest that the right hemisphere, specifically the right parietotemporal junction, is critically involved not only with empathising, and reorienting attention, but in attributing a belief to another person⁴⁸ – being able to tell what someone else is thinking; and in distinguishing agency– being able to tell who did what (see Plate 6[b]).⁴⁹ Where intention is not transparent and ‘might require reasoning [to] decipher it’, the right hemisphere plays a critical role.⁵⁰

Understanding the intentions of others is severely impaired in right hemisphere damage, as it often is also in autism and schizophrenia.⁵¹ The right ventromedial prefrontal cortex is dysfunctional in psychopaths, who do not have the usual feelings for others.⁵² What is called ‘cognitive empathy’ is disrupted by damage to the left cingulum,⁵³ but what, by contrast, is called ‘emotional empathy’ is diffusely served by the right hemisphere, with areas of particular significance within it, including the right frontal cortex,⁵⁴ the right temporoparietal region,⁵⁵ and the right uncinate fasciculus.⁵⁶ This bundle of nerve fibres, incidentally, is an important white matter ‘superhighway’ connecting the frontal with the temporal region, and is one of the last white matter tracts to mature in the brain (often in the 20s or even 30s).⁵⁷ This tract, and the other huge

integrative, white matter ‘superhighway’ of each hemisphere, the superior longitudinal fasciculus, is larger in the right hemisphere in normal subjects⁵⁸ (see Plate 2[a]). Its role in connecting emotional centres in the limbic system with the orbitofrontal cortex explains why abnormalities of structure and function in the tract have been implicated in psychopathy;⁵⁹ as well as in autism, where the right uncinate fasciculus has been found to be smaller than the left.⁶⁰ And, once again, abnormalities of both volume and myelination here and in other white matter tracts have also been implicated in schizophrenia.⁶¹

Empathy is not the result of solving a cognitive conundrum. Philosopher Matthew Ratcliffe argues that

interpersonal understanding is seldom, if ever, a matter of two people *assigning* intentional states to each other but emerges out of a context of interaction between them. Self and other form a coupled system rather than two wholly separate entities equipped with an internalised capacity to assign mental states to the other. This applies even in those instances where one might seem to adopt a ‘detached’ perspective towards others.⁶²

SOCIAL AND EMOTIONAL RESPONSIVENESS

The right hemisphere is the mediator of social and emotional behaviour.⁶³ People with right hemisphere damage may show a ‘blanket disregard’ for the feelings, needs and expectations of others.⁶⁴ As Allan Schore has demonstrated, the mutual gaze of mother and infant mediates, and is mediated by, the mother’s right orbitofrontal cortex engaging with that of her infant, and is critical for the development of a stable, secure individual, no longer fused with, but still deeply bonded with, the mother – a vital foundation for any coherent society of individuals, both mutually dependent and independent as they are.⁶⁵

Jean Decety and Thierry Chaminade, two leading neuroscientists of affect, write that ‘self-awareness, empathy, identification with others, and more generally inter-subjective processes, are largely dependent upon ... right hemisphere resources.’⁶⁶ If I imagine myself in pain, I use both hemispheres, but your pain is in my right hemisphere.⁶⁷

So-called ‘mirror neurones’ have become so topical that they have passed into popular culture, where there is a probably exaggerated idea of their significance. These are neurones that are active both in carrying out an action, and in watching another carry out an action. Clearly this is fascinating, because it suggests that we do literally experience some of what another is experiencing when we watch and empathise. Mirror neurones may lie behind the important capacity for imitation, which is an essential element in human evolution.⁶⁸ But it is likely that such mirroring qualities are a feature of many much broader networks in the brain, and may simply describe an aspect of the functioning of the nervous system in general, whereby it attunes to other nervous systems, rather than of a special region within it.

Both hemispheres have mirror neurones, but the system is in an important respect right-lateralised.⁶⁹ What makes the difference as to which hemisphere is involved is not just the location of an action in space, but more importantly its nature. When the action is instrumental, the left hemisphere is involved, but when it is non-instrumental, the primary contribution is from the right frontal and temporal regions.⁷⁰ For example, in reading and ‘mirroring’ the expression on another’s face, it is the mirror

neurones of the right pars opercularis, in the frontal lobe, that are primarily active (it is they, amongst others, that appear not to function in autism, though such mirroring defects are part of a bigger picture). Over and above differences in mirror neurones, there is a distinction between observing instrumental action – a hand reaching out to grasp, say, a glass – and the perception of signs conveyed by expressive, fluid motion, for example, sequences of dance-like, whole-body movements. The first activates the left temporoparietal region, and the second the right temporal and limbic region.⁷¹ In fact, viewing non-instrumental, biological motion is largely right hemisphere-dependent, regardless of whether it happens in the left or right field of vision.⁷² Kinaesthesia (awareness of the position and movement of the parts of the body) seems largely dependent on the right hemisphere as does perception of limb movement.⁷³

Simultaneous EEG monitoring of two subjects communicating, while ‘both participants are continuously active, each modifying their own actions in response to the continuously changing actions of their partner’ reveals synchronisation, at the millisecond level, of the right centroparietal and right temporoparietal regions in each subject.⁷⁴ They really do ‘resonate’.

Essentially, the left hemisphere is good at understanding the *what* of motor actions such as grasping a fork, picking up a cup, or flicking a switch, but not good at understanding the *why*. For that we need the right hemisphere, especially the right temporoparietal region. But this only begins to convey the hemisphere difference involved.

It sounds like a nice symmetrical division of labour: *what* in the left, versus *why* in the right. Indeed, in a split-brain patient, there was found to be a left hemisphere dominance for understanding *what* is done, and a right hemisphere dominance for understanding *why* an action is carried out.⁷⁵ These aspects of experience are not, however, of equal value. As the authors of one important paper in the area put it, ‘the simple action of pressing a switch has many possible interpretations – the actor could be turning on a light, deleting critical files from a computer, or even turning off a life-support system’.⁷⁶ Full marks to the left hemisphere for being able to work out that a switch is being pressed; but surely when we say understanding, we mean more than that. We in fact mean all that is hidden under the deceptively short word ‘why’ – the answer to which could be as long as a novel. Understanding, in this case, really means *understanding*; the mere *identification* of an action could, after all, be well enough performed by a

computer, without any understanding being involved. Understanding the motivations of an action means understanding what it is to be a living human being, and working out what makes sense in a context as wide as our lived experience – and it comes by virtue of the right hemisphere. This is not just a ‘stage’ in a serial process: it is something that begins at the start of understanding the *what* of the action, and is rapidly and reverberatively revisited by the right hemisphere over the time course of milliseconds, reassessing the situation, to the point where we ‘see’ what is going on. The right hemisphere areas involved ‘do not simply function as part of a serial, unidirectional network’ but are part of ‘a highly dynamic process’.⁷⁷

Children with autism recognise readily enough *what* another individual is doing,⁷⁸ but frequently fail to understand *why* the individual is doing it.⁷⁹ Reminiscent of Gazzaniga’s remark that ‘unlike the left hemisphere, the right hemisphere, in our view, places a premium on the truth’, is a comment by Julian Keenan and colleagues: ‘The right hemisphere, in fact, truly interprets the mental state not only of its own brain, but the brains (and minds) of others.’⁸⁰ More than that, in the words of Jaak Panksepp, an acknowledged authority on ‘affective neuroscience’ (the title of one of his best-known works), ‘in short, our left hemisphere – the one that typically speaks to others – may be more adept at lying and constructing a social masquerade ...’⁸¹

Emotional receptivity and expressivity

In general, a huge body of evidence confirms that the right hemisphere is much superior to the left in receiving, interpreting, recalling or understanding anything that involves emotion. This is pretty much the whole of the human realm (and more broadly the realm of the animate), especially the social realm – how we relate to one another; and there is an equivalently large literature supporting the superiority of the right hemisphere in all aspects of social perception. The superiority of the right hemisphere extends to the emotional aspects of verbal language, and a general capacity for emotional memory, as much as to body language or the language of the human face.⁸² Behavioural evidence in normal subjects, lesion data and neuroimaging studies ‘strongly support’ the idea that face processing depends more on the right hemisphere, as does eye gaze

perception.⁸³ A large body of studies documents that unconscious ‘processing’ of emotional ‘information’ goes on mainly in subcortical regions of the right hemisphere, and that unconscious emotional memories are stored in the right hemisphere.⁸⁴ Participants in a theatre or film-showing prefer to have the main part of the scene relayed to their (left visual field) right hemisphere.⁸⁵ A study of 37 patients with focal brain damage revealed no impairments in recognising any emotion in subjects where the lesion was limited to the left hemisphere.⁸⁶

Human voice perception is strongly lateralised to the right hemisphere in all respects.⁸⁷ Discrimination of the naturalness of the voice, the sex and the identity of the speaker, especially involve the right superior temporal sulcus and a neighbouring region, the precuneus.⁸⁸ Scanning studies demonstrate that the right temporal lobe and right inferior prefrontal cortex are the primary areas involved in emotional prosody (tone of voice),⁸⁹ evidence supported by cases of brain-lesioned patients with a deficit in speaker discrimination or recognition.⁹⁰ One reason that schizophrenic subjects may not pick up on prosody is that they exhibit (as do bipolar patients) left lateralisation of the normal right-lateralised temporal lobe response to emotional prosody.⁹¹

There is a rightward asymmetry of cortical involvement in laughter – both its production and perception – confirmed by meta-analysis.⁹² Furthermore, the reception of non-verbal human sounds, including laughing, but also crying and shrieking, are strongly lateralised to the right hemisphere.⁹³

Although there is a theory espoused by Richard Davidson that the left hemisphere processes positive and ‘approach’ emotions and the right hemisphere negative and ‘withdrawal’ emotions, I have explained elsewhere why this is not convincing.⁹⁴ This does not explain why repellent odours have been repeatedly found to activate the left hemisphere, pleasant ones the right hemisphere.⁹⁵ Indeed, more direct evidence shows specifically that greater relative right hemispheric activation has been found to be related to approach, rather than avoidance motivation;⁹⁶ that activation of the left temporal cortex increases the susceptibility to experience negative emotions;⁹⁷ and that the effects of cortical stimulation on experienced emotion provide ‘clear evidence for left lateralisation of negatively valenced effects’ and ‘strong right lateralisation of neutral

effects', which is quite the opposite of what the valency model would predict.⁹⁸

An alternative theory is that the right hemisphere is dominant for all forms of emotional receptivity and expressivity, although it appears that the left hemisphere is particularly specialised in dealing with the expression of anger and disgust. A right hemisphere bias for the production and perception of emotional expressions appears to be (with the above exceptions) independent of valence.⁹⁹ Guido Gainotti, who has repeatedly reviewed the literature, writes that 'the great majority of studies conducted both on normal subjects and with brain-damaged patients have supported the "right hemisphere dominance" hypothesis' – ie, that the valence of the emotion is not the critical factor.¹⁰⁰ One piece of research both confirmed the right hemisphere dominance hypothesis and specifically contradicted the approach/avoidance hypothesis at the same time:

all emotions showed significant lateralisation to the right hemisphere; however, differences in strength of lateralisation within the right hemisphere were found. Stronger patterns of right hemisphere lateralisation were found for positive emotions and for emotions of higher intensity.¹⁰¹

Further, a more recent study of patients with damage to the right inferior parietal cortex 'did not support the hypothesis about division of labour between hemispheres based on the emotional valence'. It found that the 'dominant mood in [right hemisphere-lesioned] patients is a neutral placidity; sometimes it is interrupted by bursts of irritated aggression, but there are no episodes of worries, fear or vivid happiness'.¹⁰² Such subjects are often quite out of touch with their own emotions, and can't be expected to report them correctly: one patient, in a state of 'intense irritation' and 'just after two aggressive attacks' directed at his mother sitting nearby,

selected as a descriptor of his state the photo of a boy whose smiling face almost 'radiated' happiness. After a long search for an appropriate photo, another patient said: 'No, there is no such photo here as I do not feel anything.'

This is part of the picture of lack of awareness of the body. These patients seemed to have no awareness of fatigue or pain. One who was 'obviously exhausted' denied fatigue; another said he could never understand what it meant 'to be fatigued'. 'Should I have some pains?', he continued. 'But I have no pains, nowhere.'¹⁰³ Yet another study found that a right hemisphere-damaged patient 'did not have a proper notion of what a facial expression of happiness looks like, and could not adequately apply this label', and concluded that 'the proper recognition of both negative and positive facial expressions relies on the right hemisphere, and that the left hemisphere produces a default state resulting in a bias towards evaluating expressions as happy', even if they clearly are not.¹⁰⁴ This is in keeping with its tendency to fatuous optimism.

Stephen McKinnell noticed after his left hemisphere stroke that he was much better at reading faces, and that he and other similar patients could communicate insights between one another without speaking.¹⁰⁵ The highly articulate self-report of a patient ('Professor F') who had a left frontoparietal stroke revealed an increase in his capacity for emotional depth. His wife described him as, prior to the stroke, having 'a rather rational attitude toward life'. After the stroke he described the opening of a new 'emotional dimension', from which he 'relates to himself and to the world':

I thank the accident because deep down I start to perceive in myself, to perceive from reality, things that I did not perceive before. I mean, ways of relating, of being with myself, ways that I did not have before. This has been the strongest change ... to be now beginning to grasp the emotional thing, the emotional dimension in me ... Emotions were hidden by rationality ... Happy feelings ... the accident did not reduce them, but on the contrary, it augmented them. The capacity to feel moved, the capacity to cry ... and this is part of my life. The accident made me more sensitive to that.

In the case of positive emotions ('I am certainly happier than before', he says), this seems to generate feelings of well-being and satisfaction, as well as to facilitate the capacity to empathise with other people's happiness. Yet he also feels sadness with greater intensity:

especially in relation to sadness ... the intensity pulls me to be sadder than I am ... For example, there are times when I have been sad and I do not know why ...

His objectively assessed ability to understand and interpret emotions was intact with the single marked exception, interestingly enough (given his left hemisphere lesion), of disgust.¹⁰⁶

I would like to propose an alternative theory, closer to the theory of right hemisphere dominance for all emotions, but with a refinement. What is striking is that anger, irritability and disgust stand out as the exceptions to right hemisphere dominance, fairly dependably lateralising to the left hemisphere. That is, of course, in keeping with the concept that the right hemisphere is required for emotional *depth*, which I would argue is certainly part of the picture. But the other part is that, in keeping with everything else we know about hemisphere differences, the right hemisphere is engaged in social bonding and empathy, the left hemisphere in social rivalry and self-regard. This explains the clear relation between sadness and the capacity for empathy, guilt and compassion, all of which appear to be associated with predominance of the right frontal pole; and elation with irritability, anger, insensitivity and exuberant self-confidence, all of which appear to be associated with predominance of the left frontal pole. Terms such as ‘positive’ and ‘negative’ (in what sense?), ‘approach’ and ‘withdrawal’ (to what end?), are blunt instruments and should be retired.¹⁰⁷

It is principally the right hemisphere that enables us not only to identify and remember individual faces, but also to understand their expressions. We have seen that the inability to recognise faces, called prosopagnosia, suggests right hemisphere damage: in classic cases, the face lacks depth and is flattened like a plate, with a few large features. In one sense, it is a problem of relating the parts to the whole. Relying on the left hemisphere alone, we are reduced to relying on the obtrusive parts – a nose, say, or, in the case of Sacks’s Dr P, his wife’s hat – not on the configuration of the face in its entirety.¹⁰⁸

Human beings use primarily the right hemisphere for perceiving facially expressed emotions: ‘right hemisphere dominance in face perception and individual recognition ... is, in fact, one of the more notorious lateralization effects in our species.’¹⁰⁹ But not just in our species.¹¹⁰ This results in what

is known as the left-gaze bias (note that this is facilitated by rightward, not leftward, turning of the head), whereby the right hemisphere of the perceiving subject is preferentially brought into play. A study comparing the left-gaze bias in humans and in laboratory-raised rhesus monkeys found important similarities – and differences.¹¹¹ Interestingly, in humans a clear left-gaze bias was found only when looking at human faces, whereas monkeys showed a clear left-gaze bias for both human and monkey faces. A subsequent fMRI study demonstrated a more pronounced activation of the right superior temporal sulcus in macaque monkeys,¹¹² and the same advantage to the right hemisphere in face recognition, as in humans, has also been found in split-brain monkeys.¹¹³ Appropriate eye contact is controlled largely by the right hemisphere.¹¹⁴ Mutually shared gaze, the interpretation of the face and the voice, in terms of all that each communicates implicitly, as well as its age and sex if unfamiliar, and its identity if familiar, are all highly dependent on the right hemisphere, as is olfactory perception of body odours and pheromones.¹¹⁵ The same is true of biological motion perception, as we have seen.¹¹⁶ A review of social perception in three modalities – visual, auditory and olfactory – concludes that ‘in all of the three modalities considered, the assignment of a dominant role to the right hemisphere in social perception would appear well deserved.’¹¹⁷ The right hemisphere specialises in the interpretation of facial expression and body language.¹¹⁸ Moreover the right temporal region appears to have areas not only specific for living things, but additionally for all that is specifically human; and this is distinct from its advantage in reading human faces.¹¹⁹

So much for receptivity. How about expressivity?

The picture here is similar: right hemisphere-damaged subjects show diminished expressivity in, as well as receptivity to, facial expressions, vocal prosody (expressive and receptive understanding of intonation) and body gestures.¹²⁰ It is the right hemisphere that is far more capable of expression, whether this be through the voice, body or face. Since the right hemisphere has greater control over the left half of the face, in general it is the left hemiface that is more expressive.¹²¹

This almost certainly lies behind the well-attested finding that portraits tend to show the sitter looking to the painter’s left, thus exposing their more expressive left hemiface to the viewer and situating the most expressive part

of the face in the left visual field – where it is optimally positioned to engage the attention of the right hemisphere. (In *The Master and his Emissary* I discuss research which shows how this tendency has co-varied with other emotionally sensitive factors over the course of Western civilisation.)¹²² This may also lie behind the marked preference in all human cultures going back thousands of years for representations of mothers with their babies cradling the infant to the left.¹²³ This representation accords with reality, and even left-handed mothers show the same tendency.¹²⁴ (Incidentally, adults prefer paintings in which the Madonna is holding the Child to her left.)¹²⁵ This pose exposes the mother's more expressive left hemiface to the infant, and the infant's more expressive left hemiface to the gaze of the mother. As one might expect, the great apes show similar tendencies for the right hemisphere to be more capable of emotional expression and understanding, and they, too, tend to cradle their infants to the left.¹²⁶

The key areas in inhibiting reflex responses, and in making the decision to take a certain course of action rather than respond automatically, are 'highly lateralised' to the right frontal cortex.¹²⁷ Subjects with right hemisphere damage exhibit a sort of devitalisation: they are more passive and lack initiative.¹²⁸ They also exhibit an emotional flatness, as we have seen, and this is inextricably linked to an inability to interpret social and emotional clues in context. A picture of a wedding gets to be interpreted as a funeral, since 'the woman is wearing a veil and several people in the picture are crying'.¹²⁹ In the cartoon-like drawings below, subjects with left hemisphere or right hemisphere damage were compared with normal controls on their capacity to generate appropriate content for the speech- or thought- bubble.¹³⁰ The left hemisphere deficit (LHD) group did not differ significantly from normal subjects, but the right hemisphere deficit (RHD) group produced responses that were verbose, missed the point, were inappropriate and had an oddly utilitarian slant. Examples:

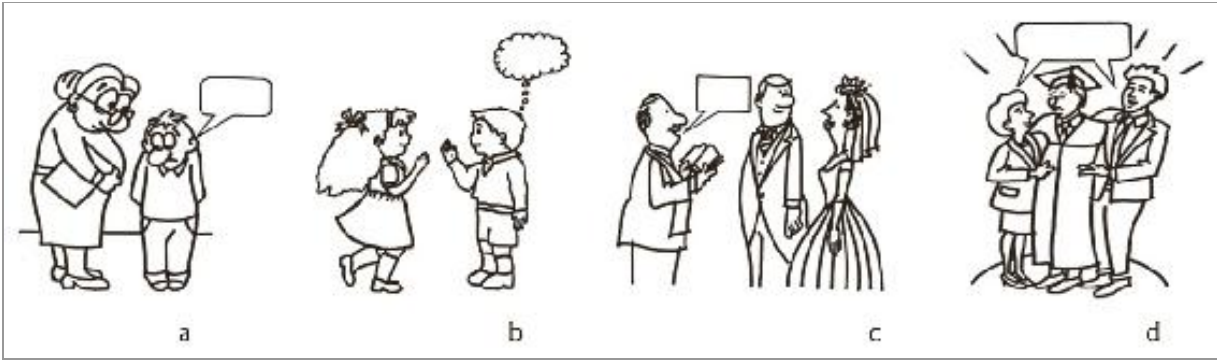


Fig. 17. 'You may now kiss the bride': impaired emotional and social understanding in right hemisphere dysfunction (from Baldo, Kacinik, Moncrief et al 2016)

a) *Normal*: 'About that assignment.'

RHD: 'OK lady. What kind of shoes did you buy?' / 'Nice shoes.' / 'Uh really honey – I didn't mean to pee on the couch.'

b) *Normal*: 'Boy, she's cute.'

RHD: 'I wonder how big her allowance is.' / 'Let's arm-wrestle.'

c) *Normal*: 'I now pronounce you man and wife.'

RHD: 'Nice to meet your bride.' / 'I now pronounce you man and wife. Or, as a licensed gynaecologist, you may need my services.'

d) *Normal*: 'This is our proudest day.'

RHD: 'Now, my boy, you're a college graduate. Now you're out to meet the world. Go out and learn how to make a dollar.' / 'Will you be paying back your loans soon, honey?' / 'Congratulations. You finally graduated. May you make your mark in your business life now.'

Given what we know about the left hemisphere's relatively limited capacity to understand human motivation and feeling, it is once again not

surprising that narrative forms of thought are associated with the right hemisphere.¹³¹ Narrative is too complex, multifaceted and involved with understanding the business of life for the left hemisphere to understand.¹³² If asked a straightforward question about their current circumstances, people with right hemisphere damage seem unable to provide the structure or overview required to answer it:

They wended their way through a maze of disassociated detail, seemingly incapable of filtering out unnecessary information. Although they had at their disposal all the components of a narrative, they could not actually assemble them into a narrative.¹³³

Right hemisphere-injured individuals have severe difficulty making the correct inferences.¹³⁴ It is the right hemisphere that understands the emotional or the humorous aspect of a narrative;¹³⁵ it is also better able to appreciate irony and sarcasm – all that is not explicit but radically alters meaning.¹³⁶ There is a large literature showing that the right hemisphere is crucial for appreciation of cartoons, jokes and humour of every kind, and that damage to the right hemisphere impairs all forms of humour comprehension and generation.¹³⁷ In fact, right hemisphere-damaged patients find it hard to tell the difference between jokes and lies – neither of which, after all, are factually correct.¹³⁸ The right hemisphere alone can infer the overall meaning of both conversation and narratives;¹³⁹ and it is the right hemisphere that makes judgments about the truth or plausibility of these narratives, either as regards story elements,¹⁴⁰ or as a whole.¹⁴¹ Right hemisphere damage leads to difficulty in understanding or deriving the theme of a story, organising sentences into stories, recalling connexions between story elements, and above all in getting the ‘gist’.¹⁴² It also leads to problems understanding non-literal meaning, eg, metaphor;¹⁴³ and figurative language, which is common in narratives of all kinds, places particular demands on semantic integration, which requires the right temporal cortex to be intact.¹⁴⁴ Even just mentally rearranging words into a sentence is impaired in right hemisphere damage.¹⁴⁵

The early twentieth-century German neurologist Walther Poppelreuter described how his patient, Robert Spyrä, a 22 year-old musketeer with right

posterior shrapnel injury, in describing a film, ‘reports a large number of correctly observed individual scenes without any grasp of the overall plot structure’.¹⁴⁶ He has literally lost the plot. If the isolated left hemisphere of a split-brain patient tries to re-tell a narrative, it lacks concreteness and specificity in its relation of the story, and becomes abstract and generic; and it gets time sequences wrong, conflating episodes that are separate in the story because they look similar (in other words, it categorises them, and therefore puts them together, even though in the lived world their meaning is destroyed by being taken out of narrative sequence). In place of a narrative, it produces a highly abstract and disjointed meta-narrative.¹⁴⁷ Once again there is a loss of living *flow*.

In a now classic study, RHD and LHD patients were compared with normal controls in constructing a coherent story, retelling a narrative, drawing inferences from behaviour in a story and selecting appropriate punchlines for a joke.¹⁴⁸ The authors comment that, amongst other things, ‘the language of [RHD] patients is often excessive and rambling; their comments are often off-colour and their humour frequently inappropriate; they tend to focus on insignificant details or make tangential remarks; and the usual range of intonation is frequently lacking.’ In this study, the LHD group performed as well as normal subjects, but the RHD group had grave difficulty. Asked to say why a man in one story acted in a certain way, only 22% of the RHD patients’ responses were correct, while the LHD patients were 90% correct (better than the normal groups’ responses, which were 80% correct).

In retelling stories, the RHD patients produced an ‘abundance of embellishments (ie, extraneous or unnecessary comments or additions to the story)’. One patient confabulated that the robber in one story had stolen all of the grocer’s groceries (instead of his money) and that, as he was escaping, he ‘tripped on a bad sidewalk, fell down, and broke all the eggs’.¹⁴⁹ Another, after finishing his retelling, pointed to the experimenter and added, ‘They called her mother, and said you were there’.¹⁵⁰ Subjects frequently and incongruously *disputed* elements in the stories, as if they misunderstood the nature of fiction. The authors comment:

These frequent intrusions suggested that, rather than respecting the story as a separate fictive entity, patients allowed personal memories

and associations, differences of opinions, and asides to surface as part of the story. Constantly violating the boundary of the stories, the patients seemed uncertain about the difference between what could happen and what actually did happen.

Once more we see the left hemisphere's difficulty in telling fantasy from reality, theory from fact. Similarly, while the subjects chose largely irrelevant punchlines to jokes, 'as in the story retelling task their reactions were serious and critical. One patient said (with respect to the final, funny frame), "The first thing I'd like to know is how the elephant got up that tree". Clearly this patient was unable to accept the "cartoon" world as different from the "real" world.'

The emotional repertoire of the RHD patients is severely limited and – yes, a little 'off-colour'. A story about a fire contained information such as the 'little girl began crying; her heart pounded as she crept in'. One patient, asked about the emotions experienced by the girl, replied that she 'didn't express any opinion or feelings except being excited. She didn't wet her panties, she didn't kiss anybody around ... and she didn't hug anybody.'

And, as usual, when the left hemisphere doesn't understand, it doesn't seem to be aware of the fact:

it should be stressed that the right-hemisphere [deficit] patients virtually never respond 'I don't know' to an open-ended question. Instead, they generally contrive an answer – confabulating if necessary – in seeming indifference to the inappropriateness of the response.

The speech of those with right hemisphere damage has been described by Penelope Myers of the Mayo Clinic as 'copious and inappropriate ... confabulatory, irrelevant, literal, and occasionally bizarre.'¹⁵¹

It is part of my thesis that the different aspects of right hemisphere dysfunction are not by any means a more or less random assortment, but a coherent reflection of a single, broad but cohesive, underlying change in the experienced nature of reality. So in a paper on constructional apraxia – the inability, almost always following right hemisphere damage, to copy, or draw from memory, a simple visual image – the authors write: 'These

patients' inability to give an overview or extract a moral from a story, to assess humorous material, to appreciate fully the significance of their disabilities, or to assess properly social situations would all seem to reflect a breakdown in normal contextual evaluation or conative awareness [awareness of the 'point']. Even constructional apraxia might be seen along these lines. Here, too, right brain-damaged subjects failed to appreciate the relationship of component objects or elements to the overall form or task, *and, in so doing, are seldom aware of their impairments and are rarely affronted or upset when corrected.*'¹⁵²

Reports of adult patients who have undergone a right hemispherectomy convey a similar picture: shallow affect, rigidity, lack of imagination. 'Together with emotional experience most of their personality vanishes as well.'¹⁵³ According to one review of patients with right hemispherectomy, 'it is in the higher and more complex integrations involving insight, emotional control, initiative, constructive ideation, and imagination that hemispherectomy takes its toll'.¹⁵⁴ One patient 'was occasionally maudlin and abnormally elated' and 'was inclined to repeat herself without being aware of it'. In another case (though he was left-handed), 'there was paucity of associations, stereotypy and some perseveration [inappropriate repetition from one context to another] of ideas ... a superficial mentation with little originality, lacking in any deep introversive processes and in motivation, and given to sudden and illogical mood swings and easy petulance.' In a different review and case report, another patient was said to exhibit 'paucity of associations, perseveration and stereotypy, concreteness of thinking, and delayed reaction times.'¹⁵⁵ Another was 'superficially smart and clever in repartee', but 'emotionally unstable, inconsistent and lacking in perseverance'. And yet another 'gave a minimum number of responses [on the Rorschach test], fatigued easily, displayed a narrow range of associations and little originality or imagination, indicating a dull intellectual functioning, and no ability for deep thinking or for adequate self-evaluation. The affect was that of a rather shallow irritability.'¹⁵⁶

Patients with right parietal damage not infrequently report (as do some schizophrenic subjects) having 'no thoughts'. An external stimulus was required 'to launch the thinking process'. But they do not seem to complain about the lack of thought. This 'emptiness of mental life' appears to go hand in hand with the loss of personal and emotional memory:

Though patients' performance in ordinary memory tests could be nearly perfect, we learned about salient autobiographical events of their lives almost exclusively from relatives ... Even photos of an event were of little help: only formal knowledge such as names of participating persons and general circumstances was retrieved but nothing that was mediated by subjective experience.

And this extended to the subjective experiences of other people, even when the people were correctly recognised in a photograph.¹⁵⁷

Patients with damage to the right inferior parietal cortex avoid eye contact like autistic subjects, and even 'speaking to such a patient on the telephone, you never know for sure whether he/she is interested in a conversation or will hang up the next moment.' This is partly because their voice lacks life, is monotonous and has no emotional expression. Reciprocally, 'if one reads to the patient the same phrase with three intonations, that of doubt, mockery or fright, he/she will be unable to distinguish the variants by hearing.'¹⁵⁸

The face loses its liveliness, gesture is impoverished or stilted, and the gaze seems to be 'frozen'. Facial reactions do not disappear completely but, for example, a smile may have 'an unnatural, torturous character'. Often patients cannot recognise themselves in old photos.

Though socially inept, their formal knowledge and 'cognitive operations on information about inanimate objects' is intact, but only in 'the domain of thinking in which it is possible to ignore subjectivity: feelings, beliefs and intentions.' There are frequent social misunderstandings. By contrast, although left hemisphere damage frequently causes severe speech disturbances, 'we can understand almost everything that [such patients] wish to say or to ask, can feel their mood and often maintain a rather informative dialogue thanks to their intact facial expression, gesture and intonation.'¹⁵⁹

The left hemisphere is better able to inhibit the right hemisphere than the right is to inhibit the left.¹⁶⁰ In normal subjects, this is largely mediated by transcallosal pathways. But even without them, the left hemisphere remains 'dominant'. When, following callosotomy, there is intermanual conflict, it is always the left hand that is experienced as 'mischievous' or 'rebellious', because, although it may have superior insight, the right hemisphere's actions do not fit the left hemisphere's script. After a few

months, in most cases, split-brain subjects settle down and the intermanual conflict subsides: 'normal services are resumed', with the left hemisphere back in control. Dahlia Zaidel, who has researched with split-brain subjects for decades, writes that 'there are several sources of evidence that suggest that one hemisphere controls ordinary behaviour in split-brain patients, namely, the left hemisphere'. And she continues, 'indeed, what components are missing in verbal conversation or in nonverbal behavior are very likely those components which normally are contributed by the right hemisphere'.¹⁶¹ The emissary adopts the role of the Master.

Sperry's description of split-brain subjects is remarkably similar to the descriptions of right hemisphere deficit patients: 'Perseverance in tasks that are mentally taxing remains low in most of the commissurotomy patients, as does the ability to grasp broad, long-term, or distant implications of a situation ... their conversation tends to be restricted mainly to what is immediate and simple. Undue repetition of the same information or anecdote is common. There are indications of a tendency to fantasise, and a mild logorrhoea [excessive wordiness] seems to be present in some cases.'¹⁶² Klaus Hoppe reports of his impressions of the speaking left hemispheres of these patients after commissurotomy, that there is a paucity of dreams, fantasies, and symbols. The fantasies they have are unimaginative, utilitarian, and literalistic, their style discursive, and their themes circumscribed and rigid.¹⁶³

But it is the impact on emotion that is most striking. A split-brain patient, who had just heard that his mother had a severe illness and would shortly die, told the investigators that 'something funny' had happened – his voice, his words, his manner betrayed no hint of sadness, but rather he seemed jokey in a way that seemed incongruous to the onlooker.¹⁶⁴ Somehow his self-expression was cut off from its roots in emotional connectivity. A comparison of partially, with totally, commissurotomed patients revealed that the former used many more 'affect-laden' terms, whereas the fully commissurotomed patients exhibited more interest in detail than in feelings, and a tendency to use inappropriate words to describe emotions.¹⁶⁵ 'Hardly ever, if at all', writes Dahlia Zaidel, 'did I observe a sad facial expression, for instance. But I did observe facial expressions denoting disgust or dissatisfaction (with food, say, or with unusually long waiting periods).'¹⁶⁶

Stuart Dimond reports that in all the split-brain patients studied,

speech somehow appears to lack the quality of an essential interaction. The generative productive capacity is present but the speech emitted is often devoid of genuine interaction with the situation. This feature is difficult to describe. It is *as if a radio had been switched on*. Speech is produced but it is somehow mechanical and unempathic.¹⁶⁷

Literalism

Clearly the left hemisphere has difficulty understanding what one might call human meaning. Its attempts to understand are mechanical and literalistic.

What do we mean by meaning? If it means anything, meaning must surely go beyond rule-following (merely putting together a grammar book with a lexicon) and on into the heart of messy human experience. The words ‘mean’, ‘mind’ and ‘memory’ share common roots, so any account of meaning that does not begin in the raw stuff of human consciousness is off to a poor start. The left hemisphere on its own puts words together using often complex syntax and makes a kind of sense of them. But the real meaning of the communication, something called ‘pragmatics’, may escape it, as it would escape a computer. For example, if I say, ‘it’s hot in here today’, you understand, using your right hemisphere, that I mean ‘would you please open a window?’ Meanwhile your left hemisphere, if left to itself, notes with some puzzlement this supply of unasked for meteorological information.

Since the right hemisphere is involved in making sense of an utterance as a whole, it is recruited when we have to generate, rather than just read, the last word of a sentence – for which we have to understand not just language rules, but real-world meaning.¹⁶⁸ The right hemisphere is more sensitive than the left when it comes to discriminating unfamiliar *meaningful* from unfamiliar *meaningless* expressions.¹⁶⁹ (In fact, lexical semantics is crucial for the right hemisphere involvement in metaphor processing, in order to discriminate metaphor from nonsense.)¹⁷⁰ Semantic categorisation of usual words depends on Wernicke’s area of the left hemisphere; when the words are atypical, their semantic categorisation depends on the right hemisphere homologue of Wernicke’s area.¹⁷¹ Again,

when the words are unclear, partial or degraded, so that they can be understood only in context, the right hemisphere is of critical importance.¹⁷² And when the left hemisphere makes a mistake in contextual understanding, the interpretation is taken over by the right hemisphere.¹⁷³ In general, the right hemisphere becomes more involved as complexity of contextual understanding increases;¹⁷⁴ indeed the harder it is, in general, to interpret a sentence, for whatever reason, the more the right hemisphere homologues of left hemisphere language areas are recruited.¹⁷⁵ By contrast the left hemisphere positively *disengages* when the meaning is metaphorical or unfamiliar.¹⁷⁶

In a study of idiom comprehension, subjects were given a sentence such as ‘For weeks he hesitated to show the account books to the boss, but finally he decided he had to go in and just face the music’.



Fig. 18: Literalistic versus metaphorical thinking (from Myers & Linebaugh 1981)

There were equal numbers of subjects with right hemisphere brain damage, left hemisphere brain damage and normal controls. Their task was to choose between five pictures, only one of which showed the correct context and the correct, non-literal, meaning: two showed a literal meaning. Don't forget that people with left hemisphere damage are generally at a handicap when it comes to language, many being unable to speak, and some having difficulty understanding written or spoken language. Despite that fact, left brain-damaged subjects, relying on their right hemisphere, scored 87% correct (normal subjects scored 97%); but right brain-damaged patients, with supposedly intact language skills, scored only 27% correct.

The left hemisphere-damaged chose a literal interpretation only 3% of the time, as did normal subjects: the right hemisphere-damaged, however, relying on their left hemisphere, chose a literal meaning a remarkable 57% of the time.¹⁷⁷

One patient with a resection of a large part of his right hemisphere, when asked six weeks after the operation, 'Al, how do you feel?', replied, without a trace of irony or humour, indeed 'without any change in voice, tone or facial expression': 'With my hands'.¹⁷⁸

Back in 1973, Howard Gardner and & Gianfranco Denes had tested the ability of aphasics (subjects with loss of speech, almost always due to left brain damage) to understand both the denotative and connotative meanings of words.¹⁷⁹ They happened incidentally to include a group of six right hemisphere-damaged subjects, along with normal subjects, to act as controls, not expecting (back in those days) to find any problems with their language comprehension. However, as Gardner & Denes discovered, they had been wrong. When asked to take the connotation part of the test, all six with right hemisphere damage voiced objections, and two of them refused outright to take it; a third could not complete it. The three who did complete it did worse than some of those who were actually aphasic, although the numbers were too small to achieve statistical significance.

However, in 1984 Gardner and colleagues returned to the topic, looking at a group of 30 subjects (10 with right hemisphere damage, 10 with left hemisphere damage and 10 normal controls), and produced significant results.¹⁸⁰ In one part of the test subjects were given the words *lion*, *hawk*, and *canary*, and asked which two were more closely related. Either you choose to emphasise membership of the avian category, grouping hawk and canary together; or you choose to emphasise connotative, non-literal meaning, putting hawk and lion together as arch-predators. Another example was *deep*, *shallow*, and *wise* – you could take deep literally and emphasise the pair of opposites *deep-shallow*, or metaphorically and emphasise the metaphorical similarity *deep-wise*. As the researchers comment, 'in order to make this kind of choice, the subject must presumably ignore some components of meaning and focus on others'. What they found was that right hemisphere-damaged patients, relying on their left hemisphere, preferred denotative meanings; left hemisphere-damaged patients, relying on their right hemisphere, preferred connotative ones. Normal controls used both equally. These results were consonant with

other earlier work showing that left hemisphere-damaged patients, relying on their right hemisphere, preferred connotative meanings, grouping *tiger* and *shark* together because of their ferocity, rather than taxonomically grouping *shark* with *trout* as both types of fish.¹⁸¹

The right hemisphere therefore plays an important part in the understanding of all linguistic utterance – but, nonetheless, does not favour language as a way of expressing its perceptions of the world. Music is the primordial form of expression in the right hemisphere.¹⁸²

I have remarked that one of the most significant differences between the approach of the two hemispheres to language is that it is the right hemisphere that is best able to understand metaphor.¹⁸³ While the literature is for the most part very clear that the right hemisphere is principally involved, there are a few dissenting papers – which in itself is not surprising in science. I believe, however, that, since this issue ramifies into much of what I shall have to say about hemisphere difference throughout the book, the area could benefit from some clarification; and I'd like to take a closer look at the evidence at this point. (Those who are not particularly interested in the detail may want to move on a few paragraphs.)¹⁸⁴

Three issues tend to confound the picture here. The first is simply a failure to be clear about what one is examining. The second is a matter of methodology. And the third is epistemological: how we go about understanding metaphor – by breaking it up into parts, or by seeing it as itself part of a much bigger phenomenon? Let me take each in turn.

First, what counts as a metaphor in terms of our *experience*? Although all language may be in origin metaphorical, many of the metaphors are now dead: in other words, there is no felt gap between the use we make of each such word in daily life and the anchor in embodied reality from which it derives its meaning. Thus although it is, I hope, interesting to be aware that, for example, 'immaterial' is rooted in metaphor, we do not register the word any longer as metaphorical when using it. In calling something immaterial, I don't think and feel – and I don't suppose you do – that someone here's motherless. The word has lost 'depth', become one-dimensional. Literal.

Clichés are definitely better processed by the left hemisphere.¹⁸⁵ Thus there is not just a distinction to be made, but a polar opposition, between a fresh metaphor that still works as a metaphor, and a clichéd metaphor which no longer does. A poem cannot be composed of clichés, nor can the idea behind a joke be stale, if it is still to be funny. Distinguishing between true

metaphor and cliché is of paramount importance: according to my understanding of hemisphere difference, the live metaphor should be appreciated by the right hemisphere, while the dead metaphor, the well-worn idea, should be available to the unaided left hemisphere. This distinction has not always been carefully enough made when the brain correlates of metaphorical understanding have been investigated. Success in determining the localisation of metaphor comprehension depends on using familiar *versus* unfamiliar, or conventional *versus* unconventional, metaphors as discriminatory: and some researchers have indeed used such a paradigm.¹⁸⁶ Researchers using only highly conventional metaphors have, as might be expected, tended to find little evidence of right hemisphere involvement in ‘metaphor’ processing.¹⁸⁷ But when the metaphor is new or imaginatively demanding, the kind encountered in poetry rather than cliché, the right hemisphere is clearly involved.¹⁸⁸

Thus poetic phrases, such as ‘rain clouds are pregnant ghosts’, are understood by the right hemisphere, while clichés, such as, ‘babies are angels’, are understood by the left hemisphere.¹⁸⁹ And though familiar expressions activate the left hemisphere, whereas unfamiliar ones activate the right hemisphere, it is not just the novelty effect, but specifically the combination of novelty with metaphorical content, that appears to engage the right hemisphere.¹⁹⁰

The left hemisphere’s affinity is for what is explicit and familiar, the cliché. However, if we were suddenly to see the *literal* – not the metaphorical – meaning of the hackneyed phrase, that would refresh it and make it new: it would be a sort of metaphor in reverse, requiring insight, like seeing a joke. In fact the comedian Milton Jones makes a career out of such insights into metaphor, generating such one-liner gems as: ‘When my dad was nearing the end, he asked us to rub his back with lard – after that he went downhill fast’. In such cases the literal meaning (‘went downhill’) becomes the non-salient (unfamiliar, because non-clichéd) meaning, which accordingly should get to be processed in the right hemisphere. And the evidence confirms exactly this.¹⁹¹

Second, what about methodology? This is something I deal with in Appendix 1, so I will pass over it briefly here. The main point is this. An area of activity in one hemisphere may be limited in extent and significance, but *persistent* over the time period of a scan. Activity in the other hemisphere, though much more significant, may cover a larger area

(remember that complexity leads to wider activation) – the precise area of maximum activity, however, constantly *varying*. Under these circumstances, over the three to five second time period of the scan, the former will falsely appear much more strongly correlated with the activity than the latter. This becomes especially true when the results from numerous studies are aggregated, in an attempt to locate the ‘key’ area.¹⁹² This point is well made by one of the best meta-analyses of imaging studies on metaphor to date.¹⁹³ Adjusting for this effect brought the researchers’ findings ‘in line’, as they put it, with results from other types of study, showing right hemisphere involvement to be of fundamental importance.

According to the authors of another, almost contemporaneous, meta-analysis, this problem is also the likely explanation of one of their results: although around 130 of the points of maximal activity were in the right hemisphere, only *two* activated clusters came up in the analysis.¹⁹⁴ And, if one needed one, a third meta-analysis, which as far as I am aware did *not* allow for this effect, nonetheless concluded that involvement of the right hemisphere in processing metaphoric phrases is proportional to the degree that they are (a) not ‘conventional’, or (b) complex, or require (c) appreciation of context in order to be understood.

This study made a further important point about the interpretation of imaging: that it is not just an area’s activation that matters, but the extent of the increase in activation from baseline (eg, a change from 50–600, or even 500–600, may be more significant than one from 1,500 to 1,600). Contrasting metaphor processing with baseline, and with literal processing, in this study confirms the importance of right frontal areas and the right superior temporal gyrus.¹⁹⁵

But there is a further point that needs to be made, which though it looks similar, is subtly and importantly different. Let me put it like this. In a testing and unfamiliar situation, a military commander may decide to send in the elite troops, the SAS. The regular soldiers will be expected to maintain, and perhaps increase, their effort after the deployment of the SAS, but it is not *that* that is expected to make the difference: rather it is the addition of a new element, the skill and expertise of the special forces, *relatively* few though they may be. (For my literal-minded readers – yes, I know the brain is not an army fighting a campaign ... this is a metaphor.) As I will need to refer to it again, I will call this, for short, the SAS effect.

In this case, the left hemisphere would provide the usual language areas, the right hemisphere the special expertise required to understand metaphor.

Third, putting language aside, we know that the right hemisphere has the advantage in understanding the broad picture, as well as all that is implicit, novel, needs to be understood in context, or as a whole, and is emotionally fraught with meaning. Returning to language, what is a metaphor if it is not something implicit, whose meaning is embodied in a new image, has to be understood as a whole and in context, increases emotional impact, forges new links, and deals with a broad complexity of meaning, not a simple, narrow one? It would, then, be odd indeed if the right hemisphere were *not* better at understanding metaphor.

So how strong is the evidence that it is?

Lesion studies clearly demonstrate that individuals with right hemisphere damage exhibit inappropriate literal thinking, for which reason they often find it hard to maintain ordinary conversation.¹⁹⁶ When presented with a metaphorical phrase, patients with right hemisphere brain lesions, but not left hemisphere lesions, are generally literal-minded, and tend to select a picture representing the literal rather than the figurative meaning ('I have a heavy heart' indicates a report of one's cardiac hypertrophy).¹⁹⁷

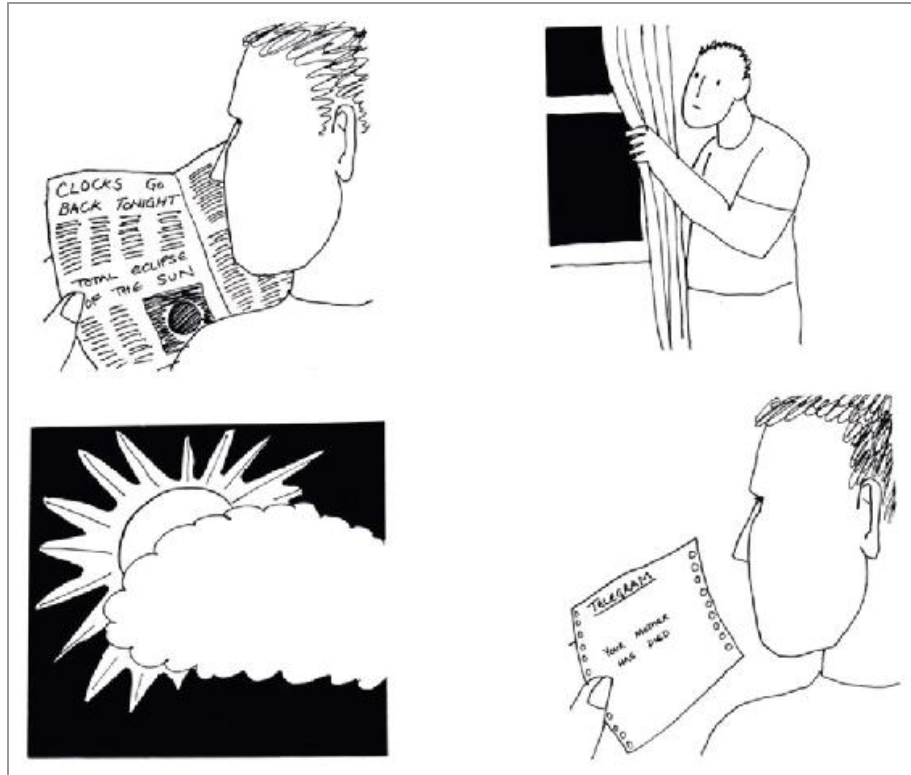


Fig. 19. 'It was a dark day for Denis' Anita Klein, 1991 (from a series of 16 commissioned by the author)

Visual field studies¹⁹⁸ and event-related potential studies confirm a right hemisphere advantage for metaphor comprehension.¹⁹⁹ TMS stimulation of the right, but not the left, dorsolateral prefrontal cortex, caused improvement in understanding of metaphors in patients with Parkinson's disease.²⁰⁰ TMS demonstrates the critical involvement of right, but not left, posterior temporal cortex, in the understanding of novel metaphors.²⁰¹ And an overview of more than 60 behavioural and scanning studies to date found a coherent pattern: the right hemisphere is better wherever there is non-obvious, non-literal meaning – including therefore, of course, metaphors.²⁰²

Most, but not all (usually for the reasons I have just outlined) functional scanning studies confirm this right hemisphere involvement in metaphor comprehension.²⁰³ In particular, they confirm the role of the right temporal lobe,²⁰⁴ the right temporoparietal junction,²⁰⁵ the right parietal region²⁰⁶ and the right insula,²⁰⁷ as well as the right medial frontal and prefrontal cortex.²⁰⁸ I draw attention to this level of detail here because it

demonstrates that metaphor comprehension is widely distributed *throughout* the right hemisphere. Hence the futility of trying to break down metaphor into ever smaller parts, and seeing metaphor as a specialised, highly local, linguistic function, since it is a *whole way of understanding reality, intrinsic to the way of being in the world mediated by the right hemisphere*.

It is obvious that metaphor induces more emotion than literal language, hence its use in poetry: unsurprisingly therefore it excites more deep-lying areas of the limbic system involved in emotional activity, including the amygdala and anterior hippocampus.²⁰⁹ The left hemisphere does not so readily understand emotional meaning. And the right temporal region is essential for the integration of two seemingly unrelated concepts into a meaningful metaphoric expression.²¹⁰ Unfamiliarity requires longer working memory, a feature of the right hemisphere,²¹¹ so that the phenomenon may be held in suspension without collapsing it into something familiar: right (but not left) middle and inferior frontal regions have been specifically related to such activity.²¹²

Studies of every kind examining indirect meaning in language – certainly metaphor, but also humour, irony and sarcasm, as we have recently seen – consistently report key activity in regions of the right hemisphere. For these, perspective-taking²¹³ and affective processing²¹⁴ are required; and both are also, independently, known to be superior in the right hemisphere.

In conclusion, then, there is here not just a narrow linguistic function, not just some kind of specialist language ‘module’ somewhere tucked away in the right hemisphere, but the *modus operandi* of the right hemisphere as a whole. The right hemisphere, in effect, becomes crucially involved whenever the question involves *meaning that is not revealed by simply following the rules*.

Here, as elsewhere, the hemispheres have a relationship of reciprocal inhibition, which it is part of the function of the corpus callosum to maintain.

Interpreting fine social signals

Our gut feelings about one another lead to conclusions that are hard to articulate, involve parallel processing of complex material and require fine

perception – all of which suggests that the right hemisphere will play a key role. Such feelings arise in social situations, where an important element is the making of very quick decisions about another human being – their intentions, how far they can be trusted, and so on. We know that this depends largely on the fronto-insular cortex of the right hemisphere.²¹⁵ (This is the same part of the brain that also reacts, instantaneously, in mothers, to the cries of distressed infants.)²¹⁶ It makes sense that these same areas of right fronto-insular cortex do not function normally in subjects with autism;²¹⁷ and there is a strong correlation between reduced activity in the right anterior insula and poorer performance on social tasks in autistic subjects, as revealed by a meta-analysis of 24 functional imaging studies.²¹⁸ Intriguingly, these same areas of the right hemisphere are both structurally and functionally unduly *prominent and active* in a relatively uncommon condition called Williams syndrome, in some senses the antithesis of autism, a chromosomal abnormality which results in ‘hyper-social’, highly empathic, anxious to please, behaviour.²¹⁹

The right anterior cingulate cortex, which has a hugely important role in relating emotion to cognition in normal subjects, is about 13% larger than its counterpart on the left – a highly significant differential.²²⁰ And what is more, it contains special fast-conducting nerve cells called von Economo neurones (after their description by Constantin von Economo, an Austrian psychiatrist and neurologist of Greek origin). These are specialised, spindle-shaped neurones, which seem to be found only in highly intelligent mammals, including the great apes, elephants, dolphins, whales, and a few other species, such as macaque monkeys, and may represent an instance of convergent evolution.²²¹ They are to be found only in three areas of the brain that are interconnected, and that are deeply bound up with empathy, social judgments and ‘gut feelings’: the anterior cingulate cortex, the fronto-insular cortex, and the dorsolateral prefrontal cortex. They are much more numerous in the right hemisphere in mature human individuals.²²² Furthermore, there is evidence from a developmental MRI study based on 316 right-handed subjects that the anterior insular and posterior orbitofrontal cortex, while thinner on the right than the left at age four, progresses by age 20 to be significantly thicker on the right.²²³ A fascinating finding is that von Economo neurones in the anterior cingulate cortex of the right hemisphere are reduced in early-onset schizophrenia –

as, of course, is empathy, social understanding and intuitive understanding.²²⁴

It seems likely, then, that when our gut feelings concern another human being, these are going to be underwritten largely by the right hemisphere. A key observation in dealing with intuition *in general* may be that the maintenance in working memory of non-verbal information, so crucial to gut feelings, depends on the right dorsolateral prefrontal cortex.²²⁵



In the world we live in, the word ‘emotional’ is almost intrinsically imbued with the idea of excess. To be emotional is to be out of control. It may help to realise that, since the right frontal cortex is essential to emotional understanding, it is also the seat of *inhibitory* control over emotional arousal.²²⁶ Anger is the hardest emotion to regulate, perhaps because it is left-lateralised, while emotional regulation is right-dominant. Self-control in different psychological domains depends on the right pars opercularis (the posterior part of the inferior frontal gyrus).²²⁷ Psychologists have measured how frequently individuals use the word ‘not’ in verbal or written language: this propensity, called activity inhibition, appears ‘to engage functions of the right hemisphere and disengage functions of the left hemisphere... A meta-analysis ... corroborated that activity inhibition is reliably associated with right-lateralised attentional sensitivity in general’.²²⁸ When activity inhibition is high it moderates the expression of the need for power, such that it is more sensitive to context and more orientated towards others; when it is low, behaviour is more power-seeking, self-centred and narcissistic.²²⁹ Being emotionally savvy doesn’t mean that one is at the beck and call of emotions – rather, the reverse. The irritable, angry and at times inappropriately elated attitude of the left hemisphere tells one that deep emotional engagement is not its forte.

The take-home message here is not so much to do with emotion in the popular sense. Too often this suggests the antithesis of ‘cool’ intelligence. However, emotion is a critical part of our capacity to comprehend the world at all, the ability to *understand* and *interact* with other living beings. Without it we are foolish, however much we may know, and we are only alive in a diminished sense of the word. Antonio Damasio describes a man

– ‘Elliot’ – who was unfortunate enough to have lost intuitive and emotional understanding, and whose life ground to a standstill, because every decision had to be calculated from first principles – as if by a machine, from ‘outside’.²³⁰ As with everything else to do with the right hemisphere that we have looked at so far, it is a matter not of *manipulating* the world, but of *understanding* it. And belonging to it. Indeed it is not so much a matter of *cogito ergo sum*, as *sentio ergo sum*.

SUMMARY

Social and emotional understanding are central to understanding all human situations. The evidence is that the right hemisphere is of critical importance for this, including the sense of reality itself, the ability to understand what another person knows, how that differs from what you know, what they mean and what their unspoken intentions might be. The right hemisphere is superior at emotional expression and receptivity. It is crucial for empathy and for a sense of agency. It is important for understanding implicit meaning, in all its forms, including metaphor, and for reading faces and body language. It understands how context changes meaning. In all these respects, the evidence is that it is superior to the left hemisphere.

COGNITIVE INTELLIGENCE

It appears that the right hemisphere may not be so dumb after all.

—Stephen Fiore & Jonathan Schooler¹

MOST PEOPLE, FAMILIAR WITH THE POPULAR MISCONCEPTION OF HEMISPHERE difference, would think that intelligence is based largely on what the left hemisphere contributed, while the right hemisphere perhaps contributed to emotional intelligence, if anything. The truth might surprise them. Bear in mind that intelligence is about *understanding*, which is not the left hemisphere's forte: its strong suit is following familiar procedures. Intelligence is revealed in seeing how to use what one knows already to tackle a problem never, in that precise form, seen before – it is creative (the subject of the next chapter).

Although higher intelligence has increased the need for brain specialisation – requiring a ‘virtual’ version of the world for us to manipulate in the left hemisphere – that does not mean that the left hemisphere is in itself the more intelligent.² Increased intelligence has enabled us to develop computers, and computers in turn can aid our intelligence; but they are intermediaries in that process, not themselves the source of our intelligence. While the left hemisphere is not a computer, it is an intermediary, an emissary – better at carrying out procedures than understanding their meaning.

Measuring intelligence is controversial, partly because, like everything else that matters, it is hard to pin down. This has – in a reflex that should by

now be familiar – led to people claiming it doesn't exist. Such people remind me of a story told by the biologist Sir Peter Medawar. 'I once spoke to a human geneticist', he wrote, 'who declared that the notion of intelligence was quite meaningless, so I tried calling him unintelligent. He was annoyed, and it did not appease him when I went on to ask how he came to attach such a clear meaning to the notion of lack of intelligence. We never spoke again.'³

More seriously, it's no good just throwing up our hands in despair and saying we don't know what intelligence is. In life we know it when we see it. Linda Gottfredson and 52 leading experts published the following definition in the *Wall Street Journal* in 1994 (it was based on an academic paper subsequently published in the journal *Intelligence*):

Intelligence is a very general mental capacity which, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings – 'catching on', 'making sense' of things, or 'figuring out' what to do.⁴

This seems to me a fair description; and by common consent the measure that most reliably corresponds to it is what is known as *g* (for 'general' intelligence).

IQ scores are one way, probably the commonest, of assessing *g*. It might be thought that, because there are a number of subtests in an IQ assessment, *g* was itself an aggregate, but it seems that it behaves as a single factor underlying all intelligence assessments: subjects who are good at one test will usually be good at the others. According to Stuart Ritchie, lecturer in psychology at King's College London and author of *Intelligence: All That Matters*, this is one of the most robustly replicated findings in all of psychological research.⁵ *g* scored in childhood correlates closely with *g* through to old age, and is predictive of many factors, including earning power and longevity.

The *g* factor involves different types of intelligence. It is conventional to distinguish *Gf*, which signifies 'fluid' intelligence, from *Gc*, signifying

‘crystallised’ intelligence. The intended distinction here is between, as far as possible, intelligence in and of itself, that can therefore be applied to any new situation or set of factors, and is hence ‘fluid’; contrasted with that which requires a certain context, builds on education, general knowledge, experience and cultural factors, and is in that sense ‘crystallised’. Clearly, people with high scores on fluid intelligence will tend to do better, and to work faster, in their culturally defined contexts as well, so G_c will to some extent reflect G_f . But it is G_f that is least culture-bound, and the best correlative of intrinsic intelligence.

A study from the Decision Neuroscience Laboratory at the University of Illinois is striking. In agreement with a broad consensus, they write that ‘in factor analytic studies, the best tests of g involve fluid intelligence or novel problem solving’.⁶ High performance in such tests is predictive of broad success in many different kinds of cognitive activity, from educational and work achievements to social well-being.⁷ The study looked at the impact of brain lesions on intelligence in 158 patients, a substantial sample. Its conclusion was surprisingly clear (see Plate 12[a]). G_f , they found, was

associated with a broadly distributed network of brain regions *primarily within the right hemisphere* ... This pattern of findings suggests that G_f reflects the ability to effectively integrate verbal, spatial, motor, and executive processes via a *circumscribed set of cortical connections in the right hemisphere*.⁸

Long white matter tracts in the right hemisphere were found to be particularly significant, eg, the superior longitudinal (and arcuate) fasciculus; which confirms previous research demonstrating their importance for general intelligence.⁹ To the extent that G_f relies on pattern recognition and ‘novel problem solving’, its right hemisphere dependence would be expected.

The researchers also show brain maps of working memory for (1) monitoring information, (2) manipulating information, (3) verbal and numeric representation, and (4) spatial representation. Monitoring information and spatial representation are almost entirely in the right hemisphere; manipulating information and representation in words and numbers almost entirely in the left.

This is one of a number of studies that point in the direction of intelligence depending preponderantly on the right hemisphere. Several reviews of the evidence have concluded that intellectually gifted subjects demonstrated more prominent right hemisphere activation than controls, especially in mathematical reasoning ability (the ability to discern patterns, though not necessarily computational skill).¹⁰ However, it is seen across the board:

There is strong evidence [in the intellectually gifted] for an uncharacteristically high level of involvement of the right hemisphere in all types of cognitive task performance (*including linguistic ones*), as well as indications of enhanced co-ordination and allocation of cortical resources between the hemispheres during intellectual engagement.¹¹

In most circumstances it seems likely that both hemispheres working together are going to be superior to either alone. What happens when one hemisphere has to be surgically removed, as is sometimes medically necessary? Data from surgical removal of a hemisphere are inconclusive. An early review suggested that, while full-scale IQ is lowered whichever hemisphere is ablated, the impact is consistently less when the left hemisphere is the one that is removed.¹² One person actually developed above normal language and intelligence after left hemispherectomy.¹³ In a more recent study, five paediatric patients had left hemispherectomy, of whom only one showed a significant drop in IQ; two had right hemispherectomy, both of whom showed a significant drop in IQ.¹⁴ However, the numbers are clearly small, which limits their general application; and a much bigger follow-up study found no significant difference in IQ by side of hemispherectomy.¹⁵ This finding may reflect the fact that in childhood the brain exhibits a high degree of plasticity.

While IQ tests are broadly a measure of g , some subtests are more correlated with g than others, and they may be to some degree subject to practice effects: a topic I will come back to. However, there are one or two physiological measures that have been found consistently to parallel g closely, and to be free from any possible training effect.¹⁶ The best known and best attested is simple reaction time: literally how ‘quick’ you are to

react appropriately to a stimulus, such as cancelling a light. It is closely related to information processing speed, and is said to be a culturally neutral biological marker of *g*.¹⁷ Shorter reaction times (whether in simple or four-choice tests) are strongly associated with general intelligence, and the correlation increases with age.¹⁸ Another physiological measure is colour discrimination ability: ‘colour acuity is strongly correlated with *g*’.¹⁹ Such a correlation turns out to be surprisingly strong, between approximately 0.7 and 0.9.²⁰

Colour acuity (as we have already seen) is associated with the right hemisphere.²¹ Is speed of reaction time? Two early studies of brain-damaged patients found that right hemisphere-damaged patients showed much greater impairment on simple reaction times than left hemisphere-damaged patients.²² So surprised were the experimenters, especially given the prevalence of right-handers (which would perhaps favour left hemisphere reaction times), that they assumed this must be because the right hemisphere-damaged group had larger lesions; but on metric analysis it turned out that they in fact had smaller lesions.²³ In other words, those with lesions in the right hemisphere, despite the lesions being on average smaller, showed the greatest losses in reaction time. On the basis of these results, the authors of a subsequent study noted that ‘it is difficult to escape the inference that the hemisphere which is non-dominant for speech is in some way dominant for simple reaction time’. After carrying out their own testing of 81 subjects (29 with left hemisphere damage, 20 with right hemisphere damage and 32 controls), in 8,100 individual trials, they concluded that ‘the effect is asymmetrical, lesions of the non-dominant [right] hemisphere producing far greater impairments than those of the dominant [left] hemisphere’.²⁴

These findings would, of course, be in keeping with the evidence that intelligence is largely right hemisphere-dependent. In case we seem to have strayed too far from the realm of mathematical intelligence, which is probably for most people, if they are honest, a ‘gold standard’ of what they mean by intelligence, it seems clear that the right hemisphere is strongly linked to maths intelligence. Those who are maths-intelligent show enhanced development and activation of the right hemisphere.²⁵ Maths-intelligent children showed the most significant differences in three areas,

all in the right hemisphere – the inferior parietal lobule, postcentral gyrus, and premotor cortex.²⁶ (See also Appendix 1.)

This is in keeping with the fact that human intelligence is not like machine intelligence – modelled, as that is, on the serial procedures so typical of the left hemisphere. Comparing artificial intelligence with human intelligence, and indeed that of organisms more generally, the microbiologist Brian Ford writes that ‘to equate such data-rich digital operations with the infinite subtlety of life is absurd’, since intelligence in life operates

on informational input that is essentially *Gestalt* and not digital. [Living systems] can construct conceptual structures out of non-digital interactions rather than the obligatory digitized processes to which binary information computing is confined.²⁷

What has been happening to *g*, our intelligent capacity to make sense of the world? I will argue in this chapter that it is in decline because we are increasingly wearing what James Flynn, one of the most famous living intelligence researchers, calls ‘scientific spectacles’. What this amounts to is that the right hemisphere understanding is being ‘elbowed’ out by the left hemisphere’s insistence that we see the world *its way*: even though this way is less intelligent.

The Flynn effect

But surely, the informed reader may ask, is it not precisely Flynn who suggested that intelligence is increasing? Flynn’s name has, after all, been lent to this development – the ‘Flynn effect’.

In the mid-1980s, Flynn, a researcher at the university of Otago in New Zealand, noticed that there seemed to be a general trend since the 1930s for IQ in Western countries to have risen significantly, by something in the order of three points per decade.²⁸ Subsequent data reinforced Flynn’s finding.²⁹ IQ scores are standardised on the population so that 100 represents the mean. Every so often the tests have to be re-standardised on the current population, and by comparing subjects’ scores on the previous

test and the new test, it was possible to detect a rise. This phenomenon is the Flynn effect and is very widely accepted.

How do I reconcile this, and the clear finding that intelligence depends on the right hemisphere, with my contention that, as a society, we in the West rely more and more on the left hemisphere? Shouldn't IQ be *declining*, not increasing?

There's more than one puzzle here. As Flynn himself pointed out more recently, if huge IQ gains were really intelligence gains, why are we not struck by the extraordinary subtlety of our children's conversation? Why do we not have to make allowances for the limitations of our parents? A difference of some 18 points in the average IQ over two generations ought to be highly visible. As he put it,

In 1900, the average IQ scored against current norms was somewhere between 50 and 70. If IQ gains are in any sense real, we are driven to the absurd conclusion that the majority of our ancestors were mentally retarded ... Either today's children are so bright that they should run circles around us, or their grandparents were so dull that it is surprising that they could keep a modern society ticking over. ³⁰

Or both. Clearly something odd was happening. Because at the same time, evidence from other sources suggested that the precise *opposite* was the case: intelligence was in decline.

Despite relentless propaganda from government in a yearly ritual claiming improvement in exam results for, say, science and maths, university lecturers noticed a decided decline in ability. For example a study published by the Engineering Council of London in 2000, prompted by university-level concern, presented evidence of 'a serious decline in students' mastery of basic mathematical skills and level of preparation for mathematics-based degree courses. This decline is well established and affects students at all levels.'³¹ Teachers from 60 university departments had used their own means of testing their incoming students' mathematical competence, and found a decline in basic mathematical skills in relation to the same A-level grades, with the decline starting in 1985. There is clear evidence that just such a lowering of standards, combined with inflation of

grades, has occurred.³² Comparing with the International Test of Developed Abilities as a benchmark, it has been demonstrated that, just between 1996 and 1999, grade inflation in A-level maths was nearly one whole grade – in only three years.³³

Maths and engineering is one of those areas in which such declines can be more easily measured than in the humanities, though similar observations have been made there. For example, a recent report on American College Testing (ACT), a standardised test used for college admissions in the United States, found that ‘without real reforms in K–12 [school, in British English] education, we will continue to see too many high school graduates entering college ill-prepared for credit-bearing college coursework and too few students earning a college degree’³⁴ – this in a nation in which those who say they have not read a single book in the last year rose from 16% in 2013 to 27% in 2019.³⁵

Another way of testing the acquisition of true understanding, rather than just ‘test smarts’, is to apply Piagetian educational stage assessments. Doing so confirms the decline. There is a test called ‘Volume and Heaviness’, which requires an understanding of how much water an object will displace. Researchers chose to look at it because it has been shown to have ‘substantial predictive validity for both science and mathematics achievement’.³⁶ To succeed at this test, 11–12 year-old children

need to have established that it is the volume of the blocks, not their weight, that determines how much water they will push aside. In 1976 many more girls than boys had an implicit model that the weight is the determining cause. The average success rate on this item in 1975/76 was 54% for boys and 27% for girls, and by 2003/04 the differential had completely disappeared, with the success rate for both at 17%.³⁷

Success of a kind, depending on what you want your results to show. As the authors comment, ‘the much higher drop by boys in this period seems to tie up with other evidence on the deterioration of boys’ learning, relative to girls, in schools. It makes it difficult to believe in the validity of the year on year improvements reported nationally ...’³⁸

On two other Piagetian tests, the Equilibrium and Pendulum tests, the results are similarly troubling. ‘From about 1975–1976 to 2006–2007, both show a huge decimation of the top scorers who could achieve at the early formal level: down from 20.35% to 4.80% and from 23.80% to 11.65% respectively ...’³⁹ I will return to the significance of Piagetian tests shortly.

The Flynn effect is not the only thing that requires explaining. There is also the subsequent reverse Flynn effect.

The reverse Flynn effect

More recently many studies have reported a ‘reverse Flynn effect’. This is a reversal of the direction of the curve: namely a year on year *decline* in intelligence test results, comparable to the original positive Flynn effect. In Finland, where military service is compulsory and where all recruits are tested using the Finnish army’s own intelligence tests, after year on year rises in three subtests during the decade to 1997, ‘from 1997 to 2009 there were declines in all three tests averaging 2.0 IQ points a decade’.⁴⁰ Such studies of entire conscript populations are available for a number of countries, and ‘allow us to conclude that there is a continuous decline in IQ scores over time and that this is a real phenomenon and not simply a blip’.⁴¹ Apart from Finland, average IQs *declined* from the mid-1990s in Norway,⁴² Denmark,⁴³ Estonia,⁴⁴ Britain,⁴⁵ France,⁴⁶ the Netherlands,⁴⁷ and Australia.⁴⁸

Flynn himself has been quick to acknowledge this phenomenon and to engage with it. In the United Kingdom, a study by Flynn found that tests carried out in 1980 and again in 2008 show that the IQ score of an average 14 year-old dropped by more than two points over the period.⁴⁹ Not good news, but there is a more worrying rider to this. Declines at the top end are steeper: ‘for the upper half of the results the performance was even worse’. Here IQ scores declined by six points. Flynn argues that the drop may be due to youth culture emphasising computer games at the expense of wider cultural stimulation, real-world play, reading books and conversation.

‘The Piagetian results are particularly ominous’, he writes:

Looming over all is their message that the pool of those who reach the top level of cognitive performance is being decimated: fewer

and fewer people attain the formal level at which they can think in terms of abstractions and develop their capacity for deductive logic and systematic planning. They also reveal that something is actually targeting that [ie, the top] level with special effect, rather than simply reducing its numbers in accord with losses over the curve as a whole ... [50](#)

And in a recent article Flynn and colleague Michael Shayer write that

...the decimation of top scores may be accompanied by gains in cognitive ability below the median. [Piagetian tests] also reveal the existence of factors that have an atypical impact at high levels of cognitive competence. Scandinavian data from conventional tests confirm the decimation of top scorers but not factors of atypical impact. Piagetian tests may be more sensitive to detecting this phenomenon. [51](#)

What emerges is that there are conflicting trends between those at the highest level of cognitive development and those ‘in the early stages’ of the next level down. Large losses at the highest level may be accompanied by gains at a lower one. [52](#) Repeating that there has been ‘without doubt a decimation of those with high cognitive ability’, they conclude:

In sum: at one time the best of Britons (aged 12–14) could cope with items on the formal level and blended into a smooth curve of performance. Now these items are beyond many of them and register as a huge decimation of high scorers ...’ [53](#)

So what happened?

It seems that a number of elements are involved.

First, initial improvements were made by picking ‘low hanging fruit’. Those at the bottom of the range could perhaps be expected to improve with better levels of nutrition, with more hours spent in full-time education, and above all with more targeted test-training. The ‘nutrition hypothesis’ predicts that gains will occur predominantly at the low end of the IQ

distribution, where nutritional deprivation is probably most severe.⁵⁴ Because there are many more in the bottom half of the distribution than there are at the very top, there appears to have been a general increase, while those at the very top, on whom universities, research innovation and ultimately national prosperity disproportionately depend, have suffered a serious decline.

Second, it seems that the sub-score increases, where they existed, were greatest in those areas that do not load heavily on *g*, the most reliable correlate of general intelligence, which a substantial body of research suggests is largely inherited.⁵⁵ According to a Dutch research team,

low-*g* participants increased their scores more than high-*g* participants ... The generalizability of test scores resides predominantly in the *g* component ... it is easy to understand why the score gains did not generalize to scores on other cognitive tests and to *g*-loaded external criteria.⁵⁶

A number of researchers have shown that the *positive* Flynn effect, the initial gain, was unrelated to *g*.⁵⁷ In fact the evidence is that the Flynn effect gains were *negatively* correlated with *g*.⁵⁸ The implication is that an improvement in results on IQ testing had nothing to do with increasing intelligence, but with ability to carry out IQ tests satisfactorily as a result of practice.

On the other hand, the *negative* Flynn effect, the more recent decline, *does* appear to load heavily on *g*.⁵⁹ Michael Woodley has suggested that there are two quite distinct effects operating, in opposite directions, a phenomenon he terms ‘co-occurrence’. The Flynn effect (rising IQ) is compatible with persistent decreases in real intelligence, and both can occur simultaneously. The idea here is similar to that proposed to explain cooling effects on the background of global warming: despite a relentless upward drift in global temperatures in the longer run, temporarily supervening cycles can independently produce, for a while, a run of colder winters. Thus while ‘genotypic intelligence’ (the level of intelligence said to result from the action of genes alone) has been declining, these declines have been offset by gains in ‘phenotypic intelligence’ (the intelligence said to result from the interaction between a population’s genes and improved

environments), as if, in an image used by one behavioural geneticist, a rising tide floated nonetheless leaky boats.⁶⁰

Third, there has been, since the 1930s, and particularly since the 1980s, a considerable focus on test-taking skills, in the hope that it might improve maths skills overall (though apparently without any positive effect in that regard). Practice might well, though, have merely caused an increase in skill at IQ test-taking.⁶¹ Indeed, there is good evidence that the Flynn effect is partly due to this change in school practice. Re-taking an IQ test usually leads to an increase of about three points in score, obviously without intelligence having changed. So while it seems likely that there have been increases in non-*g* related intelligence in the lower part of the intelligence range, the Flynn effect is due in part to increases in test-specific skills, practice effects and ‘teaching to the test’, a conclusion reached by a wide range of researchers in different countries.⁶² Arthur Jensen, the leading exponent of the importance of *g* in measuring conceptual intelligence, also pointed out that IQ, though not *g*, could be artificially inflated by training and retesting, without any significant real-world effects in terms of intelligence.⁶³

One irony, commented on by Flynn in a paper in 1987, is that, since a test known as Raven’s matrices, based on shapes not words, has been thought to be the least subject to culturally loaded words or symbols, it has been promoted as a culture-free measure of intelligence. For that very reason it has been so widely subject to coaching that it has become, in Flynn’s words, the ‘purest measure of those problem-solving skills that are most subject to cultural determination’, and as a result ‘culturally reduced content has maximized culturally influenced performance’.⁶⁴ Although Raven’s matrices invite one to ‘see’ the appropriate shape to complete the task, using inventive and analogic (right hemisphere) thinking, there are teachable algorithms that enable solving in a purely systematic (left hemisphere) fashion, without insight.⁶⁵ These were not formerly taught in school, but now often are. Their results then come to measure not so much intelligence, as diligence.

Some might say, ‘Well, if so, why worry? The same ends are reached.’ But they are not. First of all, intelligence is not being measured: following familiar procedures is something that requires no intelligence and can be done by a machine. It is the ‘novel problem solving’, involving a combination of analogic thinking and going beyond learnt procedures, that

should be being measured. In the second place, and obviously, diligence is even more productive when applied to higher intelligence, so if we are really experiencing losses of intelligence at the top end, they are so great that even diligence cannot make up for them. And in the third, there are many situations – including all truly new and therefore potentially creative ones – where diligence can be no kind of match for intelligence.

As mentioned earlier, there are one or two physiological measures that have been found consistently to parallel IQ closely, and to be free from any possible training effect: reaction time and colour acuity.⁶⁶ Simple reaction time has been measured in large populations since the middle of the nineteenth century, and has been found to be declining since the late nineteenth century.⁶⁷ Using it as a measure suggests a real decline of 13.3 IQ points between 1884 and 2004.⁶⁸ Colour acuity shows a similar trend.⁶⁹

I have mentioned a number of possible factors – including teaching to the test – leading to the ‘positive’, and subsequently ‘negative’, Flynn effect: an apparent increase in IQ, and its subsequent reversal. But there is another intriguing possible explanation that Flynn himself has put forward. This may be, as Aleksandr Luria, the ‘father of neuropsychology’, before him believed, that we have started to see the world through what Flynn calls ‘scientific spectacles’:

The scientific world-view, with its vocabulary, taxonomies, and detachment of logic and the hypothetical from concrete referents, has begun to permeate the minds of post-industrial people ... Today we have no difficulty freeing logic from concrete referents and reasoning about purely hypothetical situations. People were not always thus.

From interviews Luria conducted with peasants in remote areas of Russia, [Christopher] Hallpike culls some wonderful examples.⁷⁰ The dialogues paraphrased run as follows:

Q: All bears are white where there is always snow; in Novaya Zemlya there is always snow; what color are the bears there?

A: I have seen only black bears and I do not talk of what I have not seen.

Q: But what do my words imply?

A: If a person has not been there he cannot say anything on the basis of words. If a man was 60 or 80 and had seen a white bear there and told me about it, he could be believed ...

The peasants, of course, are entirely correct. They understand the difference between analytic and synthetic propositions: pure logic cannot tell us anything about facts; only experience can. But this will do them no good on 'Similarities' [an IQ subtest type].⁷¹

From the beginning of IQ testing, purely formal categorisation has been permitted to score more highly than concrete categorisation. According to Flynn, stating that a pound and a yard are 'both measures' (their general category) earns a higher score than saying 'you can measure things with them' (a main function of each); and calling something a 'feeling' is less concrete (and worth a higher score) than 'the way you feel'. The abstract noun (a thing), is privileged over the verbal phrase (a process). However,

a person who views the world through pre-scientific spectacles thinks in terms of the categories that order perceived objects and functional relationships. When presented with a Similarities-type item such as 'what do dogs and rabbits have in common', Americans in 1900 would be likely to say, 'You use dogs to hunt rabbits'. The correct answer, that they are both mammals, assumes that the important thing about the world is to classify it in terms of the taxonic [*sic*] categories of science. Even if the subject were aware of those categories, the correct answer would seem absurdly trivial. Who cares that they are both mammals? That is the least important thing about them from his point of view.

As you will recognise, this is to privilege the left hemisphere's way of looking at the world over that of the right hemisphere. And, as if in confirmation, a patient with his right hemisphere removed performed well on the Similarities test (IQ-equivalent 128): 'most of his definitions on the Vocabulary test were abstract. Objects were defined in terms of their membership in a wider class rather than in descriptive terms.'⁷²

'The preference for taxonic answers (categories that classify the world and extra credit for the vocabulary of science)', Flynn continues, 'is

extraordinary’; and it reached an even higher level by 2003, where previous advice to those administering the Wechsler Intelligence Scale for Children to give one out of two for concrete answers is replaced by ‘merits no or only a partial credit’.⁷³ The implication is that

if children use pre-scientific spectacles, they can get no more than half credit on most Similarities items. If the children of 1900 were given a prehistoric version of the WISC-IV, they would have a raw score ceiling of 22. This is at the 25th percentile of contemporary children aged 14 ... The hypothesis is that our ancestors found pre-scientific spectacles more comfortable than post-scientific spectacles, that is, pre-scientific spectacles showed them what they considered to be most important about the world. If the everyday world is your cognitive home, it is not natural to detach abstractions and logic and the hypothetical from their concrete referents. It is not that pre-scientific people did not use abstractions: the concept of hunting as distinct from fishing is an abstraction. They would use syllogistic logic all of the time: Basset hounds are good for hunting; that is a Basset hound; that dog would be good at hunting. They would of course use the hypothetical: if I had two dogs rather than only one, I could catch more rabbits ... [But] today we are so familiar with the categories of science and are so imbued with the scientific world-view, that it seems obvious that the most important attribute things have in common is that they are both animate, or mammals, or chemical compounds ... Our ancestors in 1900 were not mentally retarded. Their intelligence was anchored in everyday reality. We differ from them in that we can use abstractions and logic and the hypothetical to attack the formal problems that arise when science liberates thought from concrete referents.⁷⁴

Given this drift toward rewarding decontextualised thinking, it makes sense that today’s children are better at it: they do not have a rich web of naturally embodied experience to unlearn. What looked like a rise, for a while, in IQ may have been the increasing adoption of Flynn’s ‘scientific spectacles’, and a tendency to award higher marks for such a view.

Flynn has another observation to make that is also relevant. On a subtest known as Vocabulary, there had been an increase between 1971 and 2007 of 0.35 IQ points per year.⁷⁵ However, on a test of spatial ability, the ‘3DC’ or Three Dimensional Cubes test, there had been a loss of 0.48 points per year from 1977 to 2014.⁷⁶ And he continues, referring to the researchers,

They do not give a decade-by-decade break down; but their graph shows a rise to 1995 and a loss thereafter, thus implying that the rate of loss was greater than 0.48 per year between 1996 and 2014. We can find no plausible explanation of why vocabulary and spatial ability trends diverge ...

I could hazard a guess. Vocabulary is a left hemisphere test, and so scores have improved; 3DC is a right hemisphere test, and so scores have declined.

I started by asking how I could reconcile the clear findings that IQ scores depend on the right hemisphere, and that IQ scores have increased until recently, with my view that, as a society, we in the West rely more and more on the left hemisphere. My answer is that a number of factors are involved. Only some aspects of IQ – those not strongly *g*-related – have increased for some sectors of society, almost entirely in response to temporary extrinsic factors, such as better nutrition, more time spent in school, and teaching to the test, factors that can be relied on to achieve rapid gains over the short term, but will tail off, as they in fact have, as the ceiling of such effects is reached; that such factors apply across a large sector of the population, those below the mean, with the biggest sacrifice being made at the small, but significant, top end of the scale, among the gifted, who, as we know from other sources, rely particularly on the right hemisphere. And the overall trend is downward, as we now see in most highly industrialised Western countries, where the ‘low hanging fruit’ have been gathered, and no further windfall can be expected: only the effects of overall decline in intelligence, at least as things stand today.

As I write, Norwegian research on within-family changes in IQ over time shows a decline in intelligence scores of about seven points per generation, starting with those born about 40 years ago. While this does not rule out additional effects due to changing population composition, it does

establish that the large changes in average intelligence must be to a considerable extent due to environmental factors in the society in which children are growing up.⁷⁷

SUMMARY

Evidence from a number of sources suggests that the right hemisphere contributes the majority, not just of emotional and social intelligence, but also of what is ordinarily meant by intelligence (IQ) – cognitive power, or *g*. This appears to be particularly true among children and adults of the highest intelligence. Possible reasons for the apparent earlier increase and subsequent decrease in intelligence in the general population over recent decades are explored.

CREATIVITY

The mind in creation is as a fading coal ...

—*Percy Bysshe Shelley*¹

One should say ‘it thinks’, just as one says: ‘it’s lightning’

—*Georg Christoph Lichtenberg*²

CREATIVITY IS NOT A PURELY HUMAN PREROGATIVE. THE ABILITY TO invent, to respond in a way that is not programmed, is essential to survival. It is part of every living creature’s repertoire in its own degree, making new responses to changing circumstance. We know that the capacity to innovate in birds and animals is directly linked to their capacity for survival.³ Barbara McClintock even described creative innovation in the face of a novel threat by single cells, an observation that has been repeatedly confirmed. However, this capacity has reached extraordinary heights in humans, because of our ability to imagine.

In this first part of the book, I have been considering the means to truth, those faculties that our brains and minds come equipped with, which open the world to us, or alternatively obscure it from us. In Part II, I will be looking at what one might call the paths to truth, the ways in which in our lives we evaluate over a longer period of time what we are willing to accept as having at least a degree of truth, and reach a deeper understanding. These

paths, I suggest, might be thought of as those of science, reason, intuition and imagination.

This distinction between means and paths is, like most distinctions applied to the being of humans, clearly not hard and fast. And perhaps the faculty that most clearly straddles the border is imagination. What I have chosen to do is to look here, in Part I, at a certain aspect of the imagination, the creative faculty, and its hemisphere correlates, since it involves a focus on neuropsychological detail. In Part II, when I move beyond the means proffered by the hemispheres to the *paths of approach* to truth, I will consider the part played by imagination more broadly in bringing about an understanding of the world. Conventionally we think of art as the vehicle by which imagination discloses truth; and so it is. But I shall go further and argue that imagination is fundamental to *all* approaches to truth – not least to science.

For now, though, I will restrict myself to how the functioning of the hemispheres bears upon the role of creativity in our comprehension of the world.



Creativity is such an elusive phenomenon that one has to be creative oneself in how to approach it, since it can't be summoned at will, and the very act of attending to it inhibits it. Not a promising place for the researcher to start. It's no good putting people into a scanner and telling them to 'be creative', but you can ask them to find solutions to conundrums of various kinds. When neuroscientists look at 'the creative brain', much of the evidence understandably therefore concerns problem-solving. Findings in laboratory tasks considered suitable proxies for real-life functions often bear no relation to the real-life function that they are supposed to be replicating. Since the neural substrates in either case may be widely different, this needs to be borne in mind in the ensuing discussion.⁴

Successful creativity probably requires, in most instances, a combination of elements, especially in science and technology, but also in literature, art and music. The desire to analyse creativity is understandable, and while the analysis is not likely to reveal the whole story, or even the core of the phenomenon, it might contribute something to our

understanding. If one is going to analyse, one way of trying to get to grips with the process might be to analyse the various personal characteristics thought to be necessary for someone to have creative potential. A second might be to analyse the creative process as a broad sequence of temporal phases. And a third might be to analyse it into the (possibly simultaneous) interactive cognitive requirements for the process to unfold at all.

On the first, the matter of personal characteristics, Colin Martindale, a psychologist who used EEG techniques to investigate creativity over many years, had this to say:

Creativity is a rare trait. This is presumably because it requires the simultaneous presence of a number of traits (eg, intelligence, perseverance, unconventionality, the ability to think in a particular manner). None of these traits is especially rare. What is quite uncommon is to find them all present in the same person.⁵

That seems to me to be a fair assessment; but since we are more interested in how the hemispheres interact, or fail to interact, in order to bring about creativity, I will not have much more to say about the matter of personality, interesting though it might be. I just want to draw attention to the fact that a creative person is a microcosm of the process of creativity itself: drawing together at once factors not commonly combined.

In discussions of creativity, not enough attention is paid to the obvious fact that there are different temporal stages to the process, the second way in which we might attempt an analysis. Where they have been noted, they have sometimes been described as *preparation*, *incubation* and *illumination*. (A further step of *verification* is sometimes added, though this is strictly speaking not itself creative, any more than Quality Control creates the products of which it subsequently controls the quality.)⁶

The first of these phases, *preparation*, is partly conscious and partly unconscious, partly willed and partly serendipitous, and may go on for years. It is generally associated with some pretty hard work, acquiring skills and knowledge, thinking consciously and mulling things over unconsciously, so as to prepare the fertile ground in which the seed can grow. The second phase, *incubation*, is unconscious, and not under voluntary control: it can only be impeded by conscious effort and

introspection, much as it does a plant no good to keep digging it up to see how its roots are growing. The third phase, *illumination*, flowers out of the unconscious quite suddenly, again unwilled, and is effortless and accompanied by feelings of pleasure, satisfaction and fulfilment. Insight is effectively this third phase of creativity considered in isolation: the so-called ‘light bulb’ moment. As we saw in Chapter 4, such moments are robustly associated with activity in the right amygdala and right superior temporal sulcus.

Then comes Quality Control.

Clearly, something that is conscious and willed, is going to have different brain correlates from something that is unconscious and refuses the will.

You can’t make the creative act happen. You have to do certain things, otherwise it *won’t* happen. But it won’t happen while you are doing *them*. They create the terms on which the thing will arise. It’s a question of how we dispose our consciousness – that is, how we attend. Attention is a creative act, and creation is really about the induction of a highly attentive state. It is like an ear that is listening and receptive, without actually having anything at all clear yet to hear. You’ve got to have some intimation of what it is that’s coming, however, because otherwise it couldn’t come. On the other hand, you can’t actually close down too precisely on what sort of thing it is, because if you do, you will undoubtedly close down on something *else*. It involves remaining open, and yet being able to receive something which is, in the end, quite specific and particular. (In this, it is somewhat like prayer.)

At the opening of Book XII of his greatest work, *The Prelude*, subtitled *Growth of a Poet’s Mind*, Wordsworth describes how inspiration requires both the effort by which the mind ‘aspires, grasps, struggles, wishes, craves’ and the stillness of the mind which ‘fits [the poet] to receive it, when unsought’. An effort must be made at first, but, despite the effort, inspiration still only comes unsought.

This shape – to put it in banal terms, trying, failing, relaxing and then succeeding – is a fairly good way of understanding the creative process. But the fact that it depends on unconscious processes, flexibility, openness to the unknown and undetermined, relinquishing control, making imaginative leaps, seeing analogies, metaphors and images – all elements that are more characteristic of the right hemisphere than the left – does not endear it to a

certain type of science practitioner who likes his or her world left hemisphere fashion: neat, predictable, and determined by explicit procedures that are known and can be followed whenever one wishes. Mechanical and under control, in other words; rather than messily alive and unpredictable. In this chapter we will look at some examples of how this cast of mind gets in the way of an understanding of the phenomenon of creativity.

The third way of analysing creativity that I suggested is in terms of what I called the interactive cognitive requirements of the process, since they are not necessarily temporally successive stages, but often overlap and need to be combined at different levels of consciousness at once. They might be thought of like this.

In the first place, there are *generative* requirements for creative thought. These are the necessary elements that give rise to potentially creative thinking: what must happen. Then, since it is easy to inhibit potential, there are *permissive* requirements, without which the potential will not be realised: what must not happen. And ultimately there are *translational* requirements, those without which the creative impulse will not be carried forward.

It is fairly obvious that there is less we can do actively about generative requirements than about permissive and translational requirements, but nonetheless it is the generative requirements that correspond to what most people mean by true creativity. And with good reason. Without it, the other requirements – not actively to block its arrival, and to perpetuate it somehow once it arrives – amount to nothing.

GENERATIVE REQUIREMENTS

The key element in generation seems to be the ability to think of many diverse ideas quickly, demanding breadth, flexibility and analogical thinking – seeing likeness within apparent dissimilarity. This could be, and often is, summed up as ‘divergent thinking’, a term that is deliberately (and appropriately enough) loose, but suggests the bringing together of non-adjacent ideas, adaptability of thinking and originality of approach. According to a recent meta-analysis, the largest to date, of the correlates of creativity in the brain, ‘the hallmark of creativity is divergent thinking’.⁷

JP Guilford, who coined the term divergent thinking in the 1960s, contrasted it with convergent thinking, which he saw as the ability to find the single ‘correct’ answer to standard, clearly defined questions that do not require flexibility or originality, for instance in most tasks in school and on standardised multiple-choice tests for intelligence.⁸ According to the educational psychologist Arthur Cropley, *convergent thinking* ‘focuses on recognizing the familiar, reapplying set techniques, and accumulating information’:

it is thus most effective in situations where a ready-made answer exists and needs simply to be recalled from stored information, or worked out from what is already known by applying conventional and logical search, recognition and decision-making strategies. One of the most important aspects of convergent thinking is that it leads to a single best answer, and thus leaves no room for ambiguity: answers are either right or wrong ... it involves manipulation of existing knowledge by means of standard procedures, and ... its main result is production of increased knowledge.⁹

This process leads you to what is familiar and already (at least in principle) known – not, except in very rare cases, and then as a side-effect, to something unusual or original. What I mean by ‘at least in principle’ known is this. If you ask me what the product of 1,738,652 and 67,420,971 is, I don’t know, and it might be that no-one in the history of the world ever carried out precisely this calculation; but there is only one right answer, and

I can find that answer shortly, because I know what numbers are and the rules for multiplying them. In principle, then, I know the answer, and all I have to do is follow ordained procedures to solve the problem; whereas if you ask me how many colours it takes to shade any conceivable map so that no two adjacent regions have the same colour, I'd have to think in a different way.¹⁰ New discoveries – such as creativity in maths – are rarely, if ever, a matter of problem-solving of the first kind. Nor are they in science, poetry, or anything else. Guilford was a critic of a school system that emphasised convergent, at the expense of divergent, thinking.

What divergent thinking covers is *not* just being able to make up new ideas at random – most of which would be worthless – but perceiving connexions and shapes or forms that guide thinking by analogy: to broaden a field that has become too narrow, or to find alternative ways of visualising something that has become too familiar. All the literature on creativity in whatever field makes the same point: that it is about seeing hitherto unperceived parallels, seeing shapes or *Gestalten* that others have failed to see, standing back and taking the broad view, not squinting at the same microscopic field and looking up the rule book. Talent hits a target no-one else can hit, wrote Schopenhauer; genius hits a target no-one else can see.¹¹

In a posthumously published interview on creativity, Isaac Asimov wrote about Darwin's insight:

Undoubtedly in the first half of the nineteenth century, a great many naturalists had studied the manner in which species were differentiated among themselves. A great many people had read Malthus. Perhaps some both studied species and read Malthus. But what you needed was someone who studied species, read Malthus, and had the ability to make a cross-connection. That is the crucial point, that is the rare characteristic that must be found. Once the cross-connection is made, it becomes obvious. Thomas H Huxley is supposed to have exclaimed after reading *On the Origin of Species*, 'How stupid of me not to have thought of this'. But why didn't he think of it? The history of human thought would make it seem that there is difficulty in thinking of an idea even when all the facts are on the table. Making the cross-connection requires a certain daring. It must, for any cross-connection that does not require daring is performed at once by many and develops not as a 'new idea', but as

a mere ‘corollary of an old idea’. It is only afterward that a new idea seems reasonable. To begin with, it usually seems unreasonable.¹²

Creativity involves the making of hitherto concealed connexions. As Henri Poincaré noted, creative ideas

are those which reveal to us unsuspected kinship between other facts, long known, but wrongly believed to be strangers to one another. Among chosen combinations the most fertile will often be those formed of elements drawn from domains which are far apart.¹³

Divergent, in other words. Or as Steve Jobs, the creative genius behind Apple, put it,

Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn’t really do it, they just saw something. It seemed obvious to them after a while. That’s because they were able to connect experiences they’ve had and synthesize new things ... A lot of people in our industry haven’t had very diverse experiences. So they don’t have enough dots to connect, and they end up with very linear solutions without a broad perspective on the problem. The broader one’s understanding of the human experience, the better design we will have.¹⁴

Linear approaches and analytic thinking, characteristic of the left hemisphere, are fine in the right context, and may at a subsequent phase take part in creativity by narrowing things down and eliminating some of them, but on their own will not achieve creativity. And Asimov, Poincaré and Jobs all emphasise the making of (what to the left hemisphere seem to be) distant connexions.

This idea of a *broad* range is crucial. As Heraclitus put it, openness is required by the seeker of wisdom, as well as broad knowledge: ‘men who love wisdom’, he wrote, ‘must be good enquirers into many things indeed.’¹⁵ Interestingly, while the importance of a broad view is obvious when conceived in spatial terms, we forget that it also involves a temporal

element: integration of ideas from different periods of one's life, or even from different eras of history. When subjects were primed by asking them to think about the distant future, they subsequently did better on insight and creativity tasks; those asked to think about the near future did better on analytic tasks.¹⁶ The near in time is more predictable and under control, like whatever is physically 'under our thumb', and therefore more conducive to left hemisphere modes of thought.

For creativity to succeed, then, there needs to be *breadth of vision*; the capacity to forge *distant links*; *flexibility* rather than rigidity; a willingness to *respond to a changed or changing context*; as well as *tolerance of ambiguity* and of knowledge that is, at least at the outset, inherently *imprecise*.¹⁷ This all makes possible a quest for something that is truly new, not in the trivial sense of a 'novelty', but breaking out of the mould of the inauthentic, the stale and the familiar. And all this is terrain better traversed by the right hemisphere than the left, for reasons we have in part explored already, and will continue to explore. The right hemisphere not only preferentially deals with the new and unexpected, but also, as discussed, with the *unique*: generating unique rather than common responses shows 'greatest activation in the right temporal pole, which survived a whole brain multiple comparison.'¹⁸

The role of intelligence in relation to creativity has long been debated. However, it seems clear that creativity is closely linked to general intelligence.¹⁹ This is both in line with life experience, and with other related information we have: the ability to produce creative metaphors, for example, is strongly associated with fluid intelligence – and with the right hemisphere.²⁰ As we have seen, intelligence is, independently, more strongly associated with the right hemisphere than the left.²¹ Specifically, intelligence relates to creativity in two ways: there is a lower limit of intelligence compatible with creativity, which may be as low as an IQ of 85 for some kinds, and as high as 120 for others, or higher (about the level of an averagely performing undergraduate today). But creativity escalates with still higher intelligence:

creative achievement benefits from higher intelligence even at fairly high levels of intellectual ability ... This is in line with previous

studies reporting that IQ is predictive of creative achievement even within high ability groups.²²

PERMISSIVE REQUIREMENTS

A key component of creativity – one which researchers have not fallen over one another to claim – is serendipity: in other words our response to circumstances, not our capacity to alter them. People often seem to think that if you really understand the process of creativity, you will surely have many hot tips to offer on how to become more creative. (I am afraid these might be as useful as hot tips on how to become more intelligent or avoid Huntington's chorea.) But, be that as it may, the more you understand creativity, the less you will be inclined to imagine there are techniques for achieving it, even for those with any degree of aptitude.

We can't make creativity happen, but we can certainly do our best to stand in its way. Or therefore not. Furthering creativity is mainly about *not* doing, rather than doing. And in particular not doing any of the things that look obvious: trying hard, trying hard not to try, trying a systematic approach, trying a random approach, and so on. In fact trying anything at all. The creative process is inevitably governed by uncertainty, without which neither self-realisation nor creative innovation is possible. It can't be made to happen. Over-control is the enemy here as elsewhere. The less we leave things to fortune, the less likely we are to make a fortunate find. Once again one sees a conflict between the left hemisphere which sees its role as to control, and get things clear and fixed, and the right hemisphere which sees its role as to respond to the realities with which it is presented, and open up to potential. Though reason may be helpful at some stage, it can't *permit* creativity any more than it can *generate* it. It's best tactic is to back off for now.

The unwillable nature of creativity depends on the fact that the important processes are going on unconsciously, and, as the process progresses, are, at most, on the *fringes* of consciousness. And though you know it's on the fringe, because you have a feeling for what it is, the more you try to specify it prematurely, the more likely you are to get it wrong. At this stage trying hard to pin it down drives it further into the darkness. It has similar characteristics, on a large scale, to the 'tip of the tongue' phenomenon, on a small scale. If I forget a name while I am talking to someone, I feel obliged out of courtesy to cut the matter short by giving

them a clue – which is, however, often fatal. ‘Oh, you know, terribly famous German philosopher, name begins with a K – I’ll forget my own name next – come on, works are impenetrable – name *begins with a K*, I’m pretty sure.’ ‘Kant?’ ‘No, no – oh well, forget it.’ A minute later: ‘Damn it, Heidegger, of course!’ The only useful thing to do is to relax and to avert the mind’s eye. Then it will come of its own accord.

This is explicable at a neurological level, since both anxiety and narrowly focussed attention engage the left hemisphere, and each independently drives the other. The left hemisphere’s narrow-beam attention inevitably has its corollary at the neuronal level. The harder one tries, the more the left hemisphere recruits tightly knit arrays of neurones, which are part of what distinguish its structure, searching in the same area; like the man who was found searching for his keys, not where he had dropped them, but under the lamplight, because that was where he had enough light to search. Certain kinds of mind-wandering are creative;²³ narrow attention hampers creativity.²⁴ Only turning off the spotlight of left hemisphere attention enables the more complex and diffuse arrays of neurones in the right hemisphere to work on solving the problem.

And trying to see what has to be an unconscious process is like ‘trying to turn up the gas quickly enough to see how the darkness looks’, as William James memorably put it.²⁵

Here is Asimov again, this time on the permissive aspects of creativity:

My feeling is that as far as creativity is concerned, isolation is required. The creative person is, in any case, continually working at it. His mind is shuffling his information at all times, even when he is not conscious of it ...The presence of others can only inhibit this process, since creation is embarrassing ...

But if there are to be others involved:

First and foremost, there must be ease, relaxation, and a general sense of permissiveness ... a feeling of informality ... a meeting in someone’s home or over a dinner table at some restaurant is perhaps more useful than one in a conference room. Probably more inhibiting than anything else is a feeling of responsibility. The great

ideas of the ages have come from people who weren't paid to have great ideas, but were paid to be teachers or patent clerks or petty officials, or were not paid at all. The great ideas came as *side issues* ...²⁶

‘Side issues’: remember that all the really valuable things in life defy pursuit, but come unbidden when we are looking elsewhere.

Preconceptions hamper the generation of solutions since they easily turn into constraints.²⁷ Consequently, one of the ways to encourage flexibility is the relaxation of self-imposed constraints.²⁸ And, most importantly, the adoption of the stance of someone who does not know, and is prepared to listen. Those who are creative do not know their outcomes in advance, even though some idea of a purposive goal may exist.²⁹ As George Steiner puts it, speaking eloquently of Heidegger:

As knower and user, the *ego* is predator. For Heidegger, on the contrary, the human person and self-consciousness are *not* the centre, the assessors of existence. Man is only a privileged listener and respondent to existence. The vital relation to otherness is not, as for Cartesian and positivist rationalism, one of ‘grasping’ and pragmatic use. It is a relation of audition. We are trying ‘to listen to the voice of Being’. It is, or ought to be, a relation of extreme responsibility, custodianship, answerability to and for.³⁰

TRANSLATIONAL REQUIREMENTS

While these first two requirements, the *generative* and *permissive*, need to be present together, to some extent the third, *translational* element can be postponed. It depends on the business of seeing how to carry through an insight to completion. The same daring that, according to Asimov, is needed to make the connexion, is required to make something out of the insight – together with a good deal of perseverance. On attitudes to originality, especially in science, Ghiselin astutely comments:

men have developed their conservatism as a necessary guard against the dispersal of the order they live by. Whatever the cause, the tendency to distrust the widest and freest ranging of the mind is so strong that the changes necessary for the development of human life could not be attained without the efforts of the more daring and ingenious of mankind.³¹

But, as Poincaré remarked, ‘how is this faculty to develop, if, as soon as it shows itself, it is hounded out and proscribed, if we learn to distrust it before we know what good can be got from it?’³² The main qualities that help in this phase are courage in the face of discouragement, persistence, and a capacity to pursue one’s end rationally. This is, at last, where the rationalising analytic mind plays a part in creativity.

There is a phenomenon I call ‘left hemisphere chauvinism’, the tendency to discredit the role of the right hemisphere, since its methods are less predictable and potentially programmable than those of the left hemisphere, and thereby represent an affront to the narrower type of scientific mind. The right hemisphere used to be thought of as primitive, unintelligent and ‘coarse’ in its processing, because we can’t understand it so well; and a poor second to the sophisticated, intelligent and ‘fine’-processing left hemisphere – which we can. This is suspiciously like looking in the mirror and admiring what you see. It’s a point of view that is slowly dying out, but you still hear it among the diehards. And one of the myths that really irritates some neuroscientists is that there is something

special about the role played by the right hemisphere in creativity. It really seems to get right up their noses.

I know why, too – at least I know another reason why. It's not *just* that, for all except the best scientists, creativity is not their strong suit. They have got where they are by being good at following procedures, not by seeing when and how to transcend procedures. It's not *just*, either, that they have an antipathy to what Freud called primary processes, those that are unconscious, implicit and hidden from the light of day, and wish to turn them all into processes that are conscious, explicit and manipulable. It's that there is a lot of simplistic guff talked about the topic, as there is about everything to do with hemispheres.

One of the things that neuroscientists assert is that both hemispheres are involved. Well, that's easy: *of course* they are. It is inevitably the case that creativity will involve both hemispheres at some point – because absolutely everything does, just in a different way. That said, there is also a naïve belief among a few neuroscientists that that is the end of the matter. It fairly clearly isn't. The existence of popular misconceptions doesn't excuse us from evaluating the situation more fairly.

Just about everything that is said about the hemispheres in pop psychology is wrong because it rests on beliefs about *what* the hemispheres do, not about *how* they approach it: each does so in a consistently different way. And mainstream science commits the same solecism, trying to work out what each hemisphere 'does': finding they are both involved in everything, it tends to conclude that there is no difference. That conclusion is at variance with that of pop psychology, but is just as misguided, for similar reasons: it starts from the same mistaken premise: that it's the *what*, not the *how*, that matters.

Creativity is less a 'what', a thing that is done, than a manner in which whatever it may be is approached. It is not an entity, but a disposition towards the world. You can use language, engage in mathematics, draw, design, build, or compose creatively or uncreatively. Given the importance of the 'how', there is a high chance that the hemisphere's approaches will not be equally creative. And they are not.

There is nothing, in one sense, that I would like better than to be able to report that there is no lateralising element in creativity. What a relief that would be! It would earn the easy applause of my colleagues rather than the obloquy I invite. It would be a comfortable conclusion. But it simply

wouldn't be true. There is a huge and rich literature from many types of sources which finds, if nothing else, the so-called 'divergent' element in creativity to be strongly linked to the right hemisphere. And the 'divergent' element isn't all, as we shall see. Where there are rules and procedures to be followed, the left hemisphere is in its element; where there aren't, it is lost.

Creativity is one of those areas where there just aren't rules and procedures. Rule, and regulation, come from the same Proto-Indo-European root *reg-*, the meaning of which is to move in a straight line (a ruler is a tool for drawing straight lines). Creation is the business of the irregular. Even creative mathematical thinking is a matter of insight, almost always visual, *Gestalt* perception – pattern recognition, something at which the right hemisphere excels, but the left hemisphere does not understand. Only later is it re-formed according to rules, sequential procedures, left hemisphere fashion. Broadly speaking, the right hemisphere plays the role of opening up to possibility, making analogies and connexions, and the left hemisphere that of regularising, and closing down to (what it takes to be) a certainty, so that, as much as possible, what first came as a gift can be made serviceable, and called upon whenever required at will.

Thus in creativity there are bound to be at least, and at the very simplest, two phases, that may often nonetheless overlap: a phase of exploration guided by the imagination; followed, at a distance of anything from seconds to months, but in any case *followed*, by a critical sifting and evaluation of the results. Analytic, critical, convergent thinking must have something to work on: you can't think critically without something to criticise, or narrow down the field without having a field to narrow. To quote the philosopher Bryan Magee: 'Reason can be used to tear apart bad arguments and it can be used to apply universal principles to particular cases. But reason as an instrument of analysis on its own is uncreative.'³³ Or, as Schopenhauer put it succinctly: reasoning 'can give only after it has received'.³⁴

Here again is Poincaré the mathematician talking about the true scientific method, not the one you hear about at school:

It is by logic that we *prove*, but by intuition that we *discover*. To know how to criticize is good, but to know how to create is better ... Logic teaches us that on such and such a road we are sure of not meeting an obstacle; it does not tell us which is the road that leads to

the desired end. For this it is necessary to see the end from afar, and the faculty which teaches us to see is intuition. Without it, the geometrician would be like a writer well up in grammar but destitute of ideas. ³⁵

Reason cannot be the creative principle, unlike intuition: it is the quality control department only. 'Since a test is in its very nature of a negative character', wrote John Henry Newman, 'and since argumentative forms are mainly a test of reasoning, so far they will be but critical, not creative. They will be useful in raising objections, and in ministering to scepticism; they will pull down, and will not be able to build up.'³⁶

Newman was a philosopher: surely philosophy is done by pursuing logical procedures? Not necessarily so at all. Descartes' name is synonymous with logical rigour: famously his philosophy came to him one day while, an enlisted soldier, he was resting in, on, or near (according to varying accounts) a large Bavarian stove. Apparently he received suddenly 'answers to tremendous problems that had been taxing him for weeks. He was possessed by a Genius, and the answers were revealed in a dazzling, unendurable light.'³⁷ At any rate he underwent an '*enthousiasme*', a word which preserved its original and literal meaning of possession by a god (Greek, *en theos*); and experienced three visionary dreams, believing that a divine spirit had revealed to him his new philosophy.³⁸ 'It is notorious that a philosophy is not made, it grows', wrote Waismann:

Whoever has pondered some time over some dark problem in philosophy will have noticed that the solution, when it comes, comes with a suddenness. It is not through working very hard towards it that it is found. What happens is rather that he suddenly sees things in a new light – as if a veil had been lifted that screened his view, or as if the scales had fallen from his eyes, leaving him surprised at his own stupidity not to have seen what was there quite plain before him all the time.³⁹

Although it has become unpopular to see creativity as a gift, rather than something democratically achievable by anyone by dint of application, the truth is we cannot make ourselves poets: *poeta nascitur, non fit*, a poet is

born, not made. Similarly we do not put a poem, or any other work of art, together. It is not assembled from pieces, left hemisphere fashion, but conceived whole, right hemisphere fashion. 'A work of art is a unit *originally*,' wrote Susanne Langer, 'not by synthesis of independent factors. Analysis reveals elements in it, and can go on indefinitely, yielding more and more understanding; but it will never yield a recipe.'⁴⁰ Goethe as usual had the measure of it:

I can certainly put together the individual parts of a machine made of separate pieces, and, upon such a subject, speak of composition; but not when I have in my mind the individual parts of an organic whole, which produce themselves with life, and are pervaded by a common soul ... How can one say, Mozart has *composed Don Juan*! Composition! As if it were a piece of cake or biscuit, which had been stirred together out of eggs, flour, and sugar! It is a spiritual creation, in which the details, as well as the whole, are pervaded by *one* spirit, and by the breath of *one* life; so that the producer did not make experiments, and patch together, and follow his own caprice, but was altogether in the power of the dæmonic spirit of his genius, and acted according to his orders.⁴¹

Creativity, as agreed, is enormously difficult to study and the elements used to simulate it in experimental settings are only tenuously connected with how the mind actually works in creative moments. Brainstorming, for example, is, practically, the antithesis of creativity, since creativity is not 'willed', nor a matter of senseless, random forays into the unknown. There is no formula for being creative. It is something that comes to us from our unconscious mind at a moment we cannot force or predict (which doesn't mean it happens without the mind being 'prepared'); and it is by no means random, but guided by intuited shapes that are only partly seen. The point has been made many times, that if mathematicians, or scientists, or chess players, or poets, or artists, or composers had to consider methodically all the possibilities, there would not be enough time in the history of the universe. In reality only a very limited number of self-selecting forms present themselves, vaguely at first, and more clearly as the business of

creation continues, more like a picture gradually coming into focus than the following of steps towards a goal. According to Poincaré:

[creative] mathematical work is not simply mechanical ... it could not be done by a machine, however perfect. It is not merely a question of applying rules, of making the most combinations possible according to certain fixed laws. The combinations so obtained would be exceedingly numerous, useless and cumbersome. The true work of the inventor consists in choosing among these combinations so as to eliminate the useless ones or rather to avoid the trouble of making them, and the rules which must guide this choice are extremely fine and delicate. It is almost impossible to state them precisely; they are felt rather than formulated ... the subliminal self is in no way inferior to the conscious self; it is not purely automatic; it is capable of discernment; it has tact, delicacy; it knows how to choose, to divine. What do I say? It knows better how to divine than the conscious self, since it succeeds where that has failed. In a word, is not the subliminal self superior to the conscious self? ⁴²

We are drawn forwards towards some scarcely perceptible form in the surrounding obscurity, towards something we intuit is *already there*; not just propelled, as it were blindly, and from behind, by a chain of causation that has to run through all the possibilities to find one that works. That's what a computer does. It's not how the human mind works. And since creativity can never be divorced from the business of existence, which is also a continual coming into being, it is, I suspect, relevant that this is an analogy of what we are now coming to realise about natural selection, that it cannot possibly rely on purely random mutations, but must act on a self-selecting group of possibilities. I will have more to say about this in Chapter 12.

It would be tempting, but wrong, to see artistic creativity as a *necessarily* superior process in this respect, science having been relegated to purely mechanical, assembly line procedures.

Here is one of the greatest scientists of the last century, the biologist, Sir Peter Medawar:

Every discovery, every enlargement of the understanding, begins as an imaginative preconception of what the truth might be. The imaginative preconception – a ‘hypothesis’ – arises by a process as easy or as difficult to understand as any other creative act of mind; it is a brainwave, an inspired guess, a product of a blaze of insight. It comes anyway from within and *cannot be achieved by the exercise of any known calculus of discovery.*⁴³

Remember those last words when we come to consider the pronouncements of the students of the school of ‘Nothing But’-tery.

It might be thought that, while great works of art are the result of being able to see a whole structure or form from the outset – creation being the process of progressive precipitation into reality – science was altogether a different matter. Not so: Konrad Lorenz wrote eloquently about how a new scientific insight comes about. He starts with a reflection on the strange antipathy towards *Gestalt* perception among scientists, despite the dependence of science on perception by sense organs – a process that is already highly selective, interpretive and responsive to pattern:

It is one of the tragic-comical paradoxes of perverted scientific fashion that it is necessary to *legitimize* a procedure in the eyes of men who unavoidably use it in their daily work. Perception is the first step in any process of gaining knowledge of outer reality ... It is the sense organs, to which the physiological mechanisms belong, which, by complicated and non-conscious computations, abstract perceptions out of the chaos of innumerable sensory data.

And he continues:

Of myself, for one, it is simply not true that my first step in approaching any phenomenon I have observed consists in creating a rather random hypothesis and subsequently trying to find fault with it. Knowing about the functions of my perception as I do, I feel inclined to suspect that the sequence of events is, at least partly, the reverse of this. I strongly suspect that, at the time when a set of phenomena seriously begins to fascinate me, my *Gestalt* perception

has already achieved its crucial function and ‘suspected’ an interesting lawfulness in that particular bunch of sensory data. If I then spend more and more time in observation of these particular phenomena, it is already a consequence of a hypothesis which my perception has formed, though I may still be quite unconscious of it.

He carries on to describe how, as a consequence of amassing more and more data, the ‘perceived lawfulness’ or formal structure, the *Gestalt*, ‘detaches itself from the background of accidentals’, and there is an ‘aha’ moment of insight; and concludes that, in the absence of unconscious promptings,

if our conscious effort at cognition really had to start at the level of miscellaneous, unprocessed sensory data – we really should have to approach them with nothing but a consciously built-up hypothesis, as yet unsupported by any factual evidence. Inductive procedure would, I think, really be impossible and it would indeed be the best strategy of research to do one’s best to disprove a hypothesis which, in this case, would be highly unlikely to contain any appreciable amount of truth. *Gestalt* perception, on the other hand, when based on a sufficient wealth of unbiased observation, has a way of being *right*, and if one is familiar with its occasional trick of being altogether wrong and knows when to discount its assertions, it is an invaluable and quite indispensable guide. ⁴⁴

Most interesting to me is the place of time in the process: not a route march into the randomness of chaos, propelled forward by arguments that are consciously conceived, therefore by something in the past, annexing territory as one goes, but rather, after paying appropriate attention over long periods of time, being drawn forward towards something in the future, unconsciously perceived. In this connexion, a reported conversation between Max Wertheimer, the founder of *Gestalt* psychology, and Albert Einstein, about the latter’s thinking, is illuminating:

Einstein said: ‘These thoughts did not come in any verbal formulation. I very rarely think in words at all. A thought comes,

and I may try to express it in words afterward'... I once told Einstein of my impression that 'direction' is an important factor in thought processes. To this he said, 'Such things were very strongly present. During all those years there was a feeling of direction, of going straight toward something concrete. It is, of course, very hard to express that feeling in words; but it was decidedly the case, and clearly to be distinguished from later considerations about the rational form of the solution.'⁴⁵

THE ROLE OF THE RIGHT HEMISPHERE

Insights

As mentioned, there are voices that deny the special role of the right hemisphere in creativity. I will turn to them directly in due course. Meanwhile, how strong is the evidence that the right hemisphere plays, if not the only role, at any rate the crucial role in creativity?

Before I go further, let me state very clearly that my intention is not to ‘reduce’ creativity to its brain correlates, nor to find a ‘mechanism’ for creativity, nor to suggest that there is a simple, localisable creativity ‘centre’ in the brain. It is to compare two living systems fundamental to being human, those of the right and left hemisphere, and ask the perfectly legitimate and interesting question whether there are differences in the way and the degree that each is involved in creativity.

A descriptive study based on published accounts by 120 subjects of their ‘aha’ moments yielded some interesting insights into insight:

Virtually all insights involved a change in understanding ... a surprising number of insights were triggered by inconsistencies and contradictions. The insights that were triggered by contradictions seemed to depend on the person taking the anomalous data point seriously rather than attempting to explain it away ...⁴⁶

The left hemisphere’s inclination, as Ramachandran observed, is to preserve the model at all costs, dismissing an anomaly; the right hemisphere again, according to Ramachandran, is the ‘anomaly detector’, the ‘devil’s advocate’.⁴⁷

I have already referred to the principle that the right hemisphere makes more connexions, but this has truth at the most literal, concrete level. I have drawn attention to macroscopic asymmetries of the brain, but spent less time exploring fascinating asymmetries at the microscopic, cytoarchitectonic level (that of the arrangement of cells), which have major consequences for how each hemisphere ‘sees’ the world.⁴⁸ Neurones make

contact through synapses on branches called dendrites. In areas of association cortex such as the anterior temporal cortex, right hemisphere pyramidal neurones have more synapses overall, and especially more synapses far from the cell body, than those of the left hemisphere. What this means is that they make *not only more connexions overall, but connexions over a far larger area.*⁴⁹ This in turn means that the areas connected are more differentiated one from another, and that there will be a variety of types of communication going on. This contrasts with the left hemisphere's 'smaller input fields', which 'collect highly similar inputs, likely causing the neuron to respond best to somewhat redundant inputs'.⁵⁰

On first principles one would expect insight to depend heavily on the right hemisphere. Just look at what it involves: seeing the problem in a new way; connecting the problem to another that has the same structure; seeing patterns and permitting constant revision of one's mental model; seeing the problem in a broader context; making connexions between apparently remote ideas; allowing unconscious processing outside the spotlight of attention; parallel interactive processing, not serial processing, involving holding together a number of different strands of thought at the same time and integrating them into a complex new pattern rather than progressing by securing one's steps one at a time; spotting the anomaly in the current picture and not just ignoring it; accessing past experience that is relevant and letting go of memories that are impeding a solution; freedom of the unconscious from constant over-riding by conscious thought processes, and a conscious mind more open to its promptings. All these reflect aspects of brain function at which the right hemisphere is more adept than the left.

Intuition could also be thought of as the synthesis of experience with unconscious reasoning on the basis of that experience. The left hemisphere will have its intuitions, but they are likely to be misguided: the right hemisphere is more likely to be a source of good intuitions than the left because it is (1) more in touch with autobiographical memory and personal experience;⁵¹ (2) more in touch with the body and emotion;⁵² (3) better able to regulate emotion;⁵³ and (4) better able to stand apart from bias.⁵⁴ So, to that extent, intuitive insights can be identified with the right hemisphere.

Incidentally, higher intelligence has also been found to be associated with better performance on insight problems,⁵⁵ and it has been shown to be associated with the ability to solve British-style cryptic crossword puzzles, which depend on making remote associations, radically shifting

perspective, and ignoring the literal and obvious.⁵⁶ Solving such puzzles is full of ‘aha’ moments, the pleasure of which is the main reason for doing them. As we have seen, creativity, too, is linked to intelligence; and in general the right hemisphere is of more critical importance to intelligence than the left.

What do we know, from direct inspection, about the brain correlates of ‘aha’ moments? One of them is, precisely, their robust association with right hemisphere activity. When subjects try to solve classic insight problems, they benefit more from hints flashed subliminally to the left visual field (ie, the *right* hemisphere) than from hints similarly presented to the right visual field (ie, the *left* hemisphere).⁵⁷ Differences in brain activation in the left and right hemisphere seem to be indicative of insight versus non-insight solutions: ‘the right hemisphere plays a unique role in insight’.⁵⁸ In particular, the right (but *not* left) frontal and parietal regions are strongly associated with the actual (‘aha!’) moment of recognition.⁵⁹ By contrast, during serial search solutions – the way a computer would have to work – the right prefrontal cortex is either not activated, or may be specifically *de*-activated.⁶⁰

Other work suggests the importance of part of the insula, an area closely involved with the frontal cortex, and again particularly on the right.⁶¹ Even verbal problems, which classically engage the left hemisphere more than the right, rely on the right hemisphere if they require insight.⁶² We saw in Chapter 4 that functional magnetic resonance imaging reveals increased activity in the right anterior superior temporal gyrus when an insight solution occurs: this same right anterior temporal area is associated with making connexions across distantly related information during comprehension.⁶³ EEG studies confirm this finding: moments of insight are associated with a burst of gamma waves over the right temporal lobe and with activity in the medial aspect of the right anterior superior temporal gyrus.⁶⁴ These findings have been repeatedly replicated: according to one study, ‘the same network of areas all far exceeded critical statistical threshold, with the right anterior temporal region again being the strongest’.⁶⁵ A burst of alpha activity has also been observed over the right occipital cortex, just before the moment of insight is experienced.⁶⁶ This may be related to the suppression of external visual input:⁶⁷ for more detail see Appendix 1. According to Kounios and Beeman,

outwardly directed attention coupled with low anterior cingulate activity focuses processing on the dominant features or possibilities of a situation; inwardly directed attention and high anterior cingulate activity heightens sensitivity to weakly activated remote associations and long-shot solution ideas.⁶⁸

The brain correlates of solving Chinese *chengyu* riddles were observed while subjects used either conventional analytic approaches (not involving insight) or insight solutions: in insight, there was greater functional connectivity between the right inferior frontal gyrus and right middle temporal gyrus (both areas already known to be involved in insight), supporting, according to the authors, ‘the right-hemisphere advantage theory of insight.’⁶⁹ In cases where both hemispheres begin the process of problem-solving, it quickly becomes only the right hemisphere that sustains and maintains the process.⁷⁰ Once again, unconscious cues flashed to the left (the right hemisphere’s) visual field, but not those flashed to the right (the left hemisphere’s) visual field, resulted in moments of insight. These right hemisphere advantages occur only when solvers experience insight – the ‘aha!’ or ‘eureka!’ feeling.⁷¹ And all of this ties in with what we have already learnt about the importance of visual thinking, since the right lateral prefrontal cortex is also active in problem-solving using visualisation.⁷²

Literature reviews have generally concluded that the right hemisphere is dominant for the processes associated with creativity.⁷³ In a series of studies, Friedman and Förster investigate the effect of approach and avoidance cues on hemispheric activation, creativity and analytic problem-solving. Their findings suggest a relationship between approach motivation and global thinking; approach motivation and creative thinking; avoidance motivation and local thinking; and greater relative right hemispheric activation both in approach motivation and in better performance on creativity tasks.⁷⁴ A meta-analysis of 88 studies in the creativity literature by Konstantin Mihov and colleagues reported that ‘researchers of the lateral dominance have, with fair certainty, come to the conclusion that the right hemisphere and its regions are specialized for creative tasking’.⁷⁵ The authors point out that a *global* thinking style, a *context-sensitive* thinking style and a *figurative* style are each known to be involved in creative

thinking, and that each of these is, on its own, significantly more likely to involve right hemisphere dominance.

In fact the authors of this review found that a primary role for the right hemisphere was to be found regardless of whether tasks were figural or verbal, holistic or analytical, context-dependent or context-independent. They found that local processing – as has been often noted – may also be carried out at least to some extent in the right hemisphere, and that the right hemisphere contribution during global processing may be much stronger than the left hemisphere contribution during local processing. They conclude:

The systematic meta-analytic approach of our review found that in the literature covering various techniques for assessing lateral dominance and creativity, there is a consistently reported right dominance.

To make assurance doubly sure, they treated studies that showed no hemisphere difference as, instead, showing left activation only (ie, working against their main hypothesis). Even this could not ‘over-ride the effect of right hemispheric dominance’, despite, moreover, the fact that a ‘large number of the creativity tasks are in fact lexical in nature’.⁷⁶ Even studies specifically looking at a creative task that is verbal in nature – such as solving verbal problems using insight – show that they benefit from right hemisphere semantic processing, particularly again in the right anterior superior temporal gyrus.⁷⁷ And, *a fortiori*, one would expect, and one finds, that *non-verbal* problem-solving recruits largely right, rather than left, hemisphere activation.⁷⁸

Naturally, the evidence considered includes much that comes from imaging and EEG studies, which are not always easy to interpret. This is where the lesion studies – which tell us what happens to creativity when something happens to a particular area of the brain – are particularly valuable as guides to interpretation. What do they show?

HEMISPHERIC CONTRIBUTIONS TO CREATIVITY IN GENERAL

I will begin by looking at lesion studies in the general population: they provide clear evidence of the relation between the right hemisphere and originality. Patients with focal strokes in the left prefrontal cortex have been shown to outperform normal participants in creative problem-solving tasks that require breaking away from rule-based thinking.⁷⁹ According to a survey by Simone Shamay-Tsoory and colleagues, lesions in the left temporoparietal region, known to be involved with language processes, are associated with higher levels of originality, and the larger the lesion in this area, the greater the originality. The left frontal lobe may inhibit the right hemisphere during figural creative thinking in normal people, and removal of this inhibitory effect by practice or by 'specific damage to the left frontal lobe' may facilitate the emergence of artistic creativity. On the other hand, those with lesions in the right prefrontal cortex show 'the most severe impairments in originality'.⁸⁰ It is probable, as they suggest, that the more linear cognitive style of the left hemisphere, suited to its manner of language processing, interferes with creativity.⁸¹

Further, a survey of nearly 70 patients with frontotemporal dementia indicated that patients with enhanced artistic creativity showed selective degeneration of the temporal lobes, in particular a left hemisphere perfusion deficit. In nine out of 12 cases where creativity increased with the onset of dementia, the temporal pathology was worse on the left, in two cases on the right (one of which was a left-hander), and in one case the degeneration and perfusion deficits were considered symmetrical.⁸² Mario Mendez, a neurologist at UCLA, deduces from a study of dementia that artistic expression depends in particular on the right dorsolateral frontal cortex for original, divergent thinking, and suggests that 'the left parietal region and the left temporal lobe have inhibitory effects on artistic expression through attention to visuo-spatial *detail* and semantic labelling, respectively.'⁸³ Already we can see three reasons why the left hemisphere will present problems for creativity: it is too linear, too detail-focussed, and too concerned with naming or labelling, which tends to crystallise meaning prematurely.

A note on detail: there is a difference between detail-focussed attention, and attention to a whole which causes an anomalous detail to stand out. The first starts from details and never arrives at a *Gestalt*, thus missing the significance of an anomaly; the second starts with a *Gestalt*, the very existence of which draws attention to the detail that does not fit. Such a perception may cause the *Gestalt* to shift: a creative discovery. Details are not unimportant, but their significance becomes apparent only when taking in the whole. And, as Ramachandran puts it, the right hemisphere is our anomaly detector.⁸⁴

The role of flexibility in both intelligence and creativity is important, and the critical role of the right ventral prefrontal cortex is reinforced by a study of 53 patients with focal brain lesions compared with normal controls, showing that patients with focal right prefrontal cortex lesions were specifically impaired in tasks that required flexibility in set-shifting, an important component of divergent thinking.⁸⁵ Right brain-damaged patients, as another study demonstrates, show more repetitive (inflexible) behaviour than patients with comparable lesions in the left hemisphere.⁸⁶ A further study confirms that right hemisphere injury impairs flexibility of thinking and results in people becoming 'stuck in set'.⁸⁷

In a study of 60 patients with focal brain damage compared with matched controls, the right prefrontal cortex was seen to have a critical role in 'open-ended' tasks, a sign of the right hemisphere's greater ability to plan ahead, remain flexible and deal with incomplete information.⁸⁸

A detailed case study of an architect, not just carrying out typical lab tests, but doing what he was used to doing in real life, is instructive. The architect, who had developed a lesion in the right prefrontal cortex, was examined by neuroscientists Vinod Goel (who incidentally himself first trained as an architect) and Jordan Grafman.⁸⁹ They gave him a real-world architectural planning task: to develop a new design for their lab space. And they compared his performance on the task with that of another architect called in for the purposes of the experiment. The patient understood the task, observing that 'this is a very simple problem' (it is highly characteristic of individuals with right, but not left, hemisphere lesions grossly to overestimate their capacity in relation to the task).⁹⁰ He hadn't, apparently, lost any of his fund of architectural knowledge, and he was able to draw on it appropriately while structuring the problem. However,

although he could structure the problem in the abstract, he couldn't take the next step to solving it: as a result he did not start even his preliminary design until two-thirds of the way into the experiment. When he got round to it, the preliminary design was 'minimal and erratic, consisting of three independently generated fragments', and there was no progression of these fragments towards a meaningful whole. Abstract, theoretical information was not carried over into the creation of a design.

There are a number of aspects of the case of this architect that might be expected as a consequence of a right frontal lesion. I have mentioned the lack of insight into his capacity and the unawareness of his deficit; but there is also a characteristic inability to get from broad general abstractions to dealing with the real world of concrete experience; an inability to create a meaningful whole, instead producing 'erratic' fragments; and a failure of creative imagination.

Turning from the general population, what can we learn from *artists* who develop lesions? This area is admittedly not straightforward for a number of reasons. One is that creativity is hard to separate out when many brain changes occur simultaneously: for example, has the subject lost creativity, or just the practical means of expressing it? Or the will to do so? Are the problems technical – visuo-spatial distortions only, loss of manual dexterity only – or to do with creativity itself?

In the case of a left hemisphere stroke, an almost invariable problem is the loss of use of the painting hand. One might be forgiven for thinking this a catastrophe. Imagine being a great painter and suddenly having to struggle to paint precisely, delicately, fluently, naturally, by using your non-dominant hand! It is, frankly, astonishing that any regain their flair at all. Yet the evidence is that it is easier to compensate for this fairly massive motor control handicap than for the visuo-spatial handicaps of right hemisphere stroke: visual neglect, loss of depth, loss of flow, loss of the *Gestalt*.

Nonetheless, it is quite true that such losses are not indices of loss of creativity *per se*. And then there is the confusing fact that taste in modern art is more receptive than usual to elements that are visuo-spatially bizarre or distorted, something far more likely after a right hemisphere stroke, and may even celebrate such elements as signs of 'creativity'. Many elements to be found in modern art are, in fact, strikingly similar to distortions experienced in right hemisphere damage.⁹¹ So, when styles are thought to

deteriorate after right hemisphere stroke, it is not necessarily a sign of loss of creativity; and, on the other hand, when they meet with applause, this may not be a gain in creativity either, because they may simply be fashionably dysfunctional.

Nonetheless, there is some evidence that creativity is more commonly impaired by right hemisphere stroke than left.

Artists

After a right hemisphere stroke, a prominent Polish artist and sculptor, Krystyna Habura, complained that she had lost her artistic vision. She said that it was as if she had a 'hole' in her brain (she had), and could not paint.⁹² In another case, Armin Schnider and colleagues write that

our patient's post-stroke drawings were clearly different from premorbid works: spatial arrangement was disturbed by left-sided neglect, he produced no oil paintings any more, and his drawings were usually finished within 10–15 minutes, leaving them less elaborate than his premorbid efforts ... [His drawings] now appeared simplified, more sketch-like, even though the character of the lines and the compositions were similar.⁹³

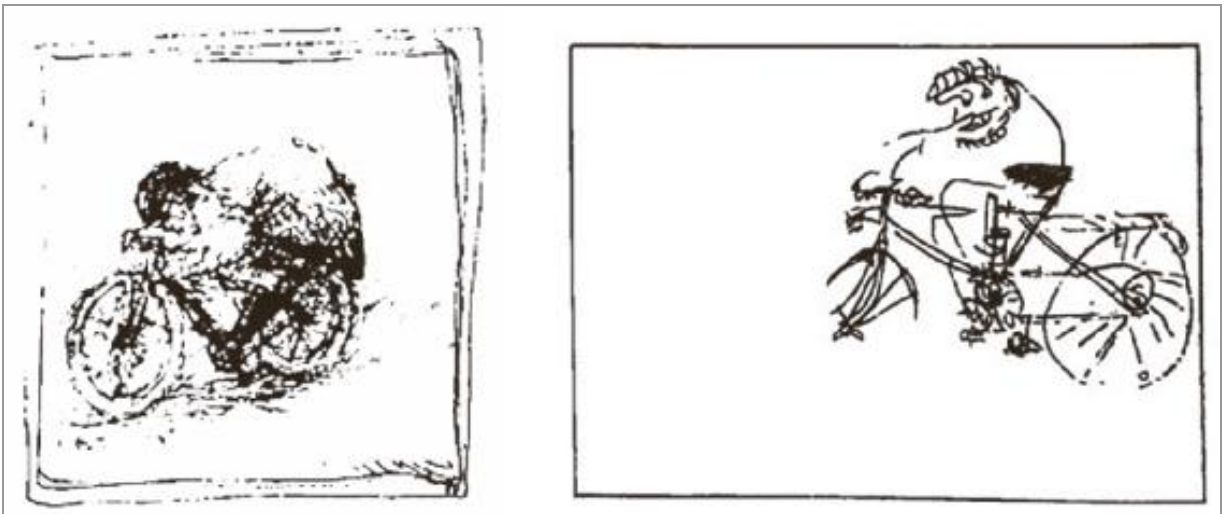


Fig. 20. Drawing of a cyclist by the same artist before and after right hemisphere strokes (adapted from Schnider et al 1993)

In an interesting paper, Olaf Blanke and Isabella Pasqualini compare what happened to a famous German painter, Lovis Corinth, and the film director Luchino Visconti, following right hemisphere strokes.⁹⁴

Corinth's stroke came in 1911, at the age of 53: art critics make a sharp distinction between his mature impressionist, pre-stroke style, and his post-stroke, possibly expressionist, style. The art critic Alfred Kuhn, writing in the year of Corinth's death, described how after the stroke 'the preponderance of the plastic and corporeal starts to disappear progressively', and pictures become 'essentially plane-like': 'the contours disappear, the bodies are often as if pulled apart, deformed, their spatial relationships distorted', as if this were no longer important to Corinth. This is in stark contrast with Corinth's pre-stroke style that made him famous, which was characterised by high levels of corporeality, the rich nuances of human flesh, and the beauty of depth and spatial relations between objects, people, and their environs.⁹⁵ Anna Mazzucchi and colleagues write:

His [post-stroke] paintings are flat and rather elementary with hardly any tri-dimensionality. There is imbalance between the right and left portions of the canvas, chromatic impoverishment ... Later on, starting in 1921, his left-side neglect becomes again obvious, together with further deterioration of his chromatic sense. Figures are flat, simplified, and at times hard to distinguish. There is a marked imbalance between the left and right side of the painting and decreased capacity to mask these problems.⁹⁶

The director Visconti's stroke came in 1972, when he was 65. His style changed dramatically. In the first place, it shifted from a spatiotemporally 'realistic' perspective induced by filming the entire scene sequence within the real location's limits (location filming with few close-ups mostly embedded into large filmic panoramas and the use of cross-fades), to a constructed 'space of glances' by frequently deployed sequences of close-ups and more static perspectives.⁹⁷ Second, this was associated with topographical and architectonic spatial disruptions, by contrast with his celebrated clarity of cinematographic space. Third, in the post-stroke films the actors much more often face the camera frontally, generating the impression of flatness of bodies and scenery, compared to the pre-stroke

films where perspectival changes as well as richness and clarity of space and figures are more prevalent, and render a more complex spatial configuration.⁹⁸ The film critic Geoffrey Nowell-Smith writes that ‘the last two films (*Conversation Piece* and *The Innocent*) were curious and puzzled his admirers as much as his detractors’.⁹⁹

There is in both Corinth and Visconti, the paper’s authors suggest, a flattening – what they call a ‘plane-like’ style – a spatial dislocation and a sense of stasis. These are all recognised consequences of right hemisphere damage.

Anton Räderscheidt was a German artist who emigrated to France in his 40s. In his earlier work he adopted a rigid, deliberately stiff, cold, achromatic style. He abandoned this style after emigrating, and his pictures became much livelier, more fluid and more colourful over the next thirty years to his death. At the age of 75 he had a right hemisphere stroke. After this he painted what he himself called his ‘nasty paintings’ (*böse Bilder*); his biographer Herzog calls them ‘acompository’, and says, that the physiognomy of the figures is ‘disfigured beyond recognition’. Of his stroke Räderscheidt said:

A stroke has taken me away from the scene of life ... I am no longer the director of this play. I have to take care, not to miss my entrance in the play. My requisites obey to tricks only. Moreover, I am missing my loud colours ... The reproduction of my surroundings is a damned difficult thing. Nothing is staying in its place, nothing is keeping the shape...¹⁰⁰

It has been suggested that his post-stroke paintings are more lively, less stiff, but, as Richard Jung says, ‘although the immobility of the earlier pictures is relinquished, this change of style is not attributable to disease, since similar representations began some years before the stroke.’¹⁰¹ Indeed they can be seen quite consistently some 20–30 years before the stroke.

Otto Dix was a well-known German painter who was severely censured by the Nazis as ‘degenerate’. In 1967, aged 76, he suffered a stroke due to a thrombosis of the right middle cerebral artery. He soon resumed painting again, until 1969 when he suffered another massive stroke and died. Following his first stroke,

there appeared an obvious lack of co-ordination between volumes and space ... the figures appear drawn in very summary fashion, strictly bi-dimensional, drawn using very elementary colors without any attempt to fuse the various parts of the painting which appears globally incoherent ... a series of deficits resulting in marked simplification added to evidence of a striking visuo-spatial disorder.¹⁰²

Plate 7 shows five self-portraits by Dix from before and after his stroke. Of particular interest is that in drawing (*f*) his right hand, holding the pencil, has obtruded into the picture and obscures a large part of the face. This hand also has six fingers (as it does in the last of his large post-stroke self-portraits, with his grand-daughter Marcella, painted in 1968 or 1969).¹⁰³

As an aside, it is curious that, for no obvious reason, Visconti's right hand is seen in the opening credits for *The Innocent*, his last film. Two phenomena may be involved here. It may be that in the absence of counterbalancing input from the right hemisphere, the right hand, the left hemisphere's tool, bulks large in the subject's world, becomes intrusive and obtrusive. And there may be a conflation of levels, leading to self-reference – a feature of left hemisphere cognitive style – so that the very hand that depicts becomes the object of depiction. The medium has lost its translucency and become opaque.

A paper by Bänzner & Hennerici describes 13 artists who had a right hemisphere stroke, of whom the authors say

the stroke influences the painting in the vast majority of artists to a relevant degree. Whereas in some cases the stroke ended the artistic career (Fellini), the majority of the painters reported resumed artistic production although they had to overcome various degrees of disability ... [including] severe visual disturbances ... Degrees of neglect can be inferred from the post-stroke artwork of virtually all of the right-hemisphere patient-artists ... [and] facial distortion in at least 6 of the right-hemisphere patients.'¹⁰⁴

Note that these cases are referred to not as exhibiting a new lease of life in the painter, but as presenting problematic distortions that might or might

not be overcome. So not a clear loss of creativity, granted; but not a clear indication that there is no such loss, either.

In the case of two other artists with a right hemisphere lesion, painting became reportedly naïve and concrete in one,¹⁰⁵ but in the other produced a rich output with excellent spatial organisation of the drawings, which goes to demonstrate that prognostication is not straightforward.¹⁰⁶

Strokes in the left hemisphere, on the other hand, despite the overwhelming motor difficulties involved, tend to leave artistic talent untouched, and in some cases even enhanced.¹⁰⁷ The great French neurologist Théophile Alajouanine knew several artists so afflicted. Of one artist, now known to be Paul-Élie Gernez, he wrote that ‘artistic realization in our painter since his aphasia remains as perfect as before. According to connoisseurs, he has perhaps gained a more intense and acute expression ... In him the aphasic and the artist live together on two distinct planes.’¹⁰⁸

Daniel Vierge, a Castilian painter, suffered a serious left hemisphere stroke at the age of 31, resulting in right-sided paralysis, with the result that he had to change his working hand. Undaunted, he carried on painting, drawing and engraving and six years after his stroke, in September 1889, won first prize at the Universal Exposition in Paris. His series of drawings for an edition of *Don Quixote* published in 1906, was, according to the writer Rafael Fraguas, ‘the climax of his art’,¹⁰⁹ in which, in the words of the *Cervantes Encyclopedia*, he ‘achieved a harmony between illustration and written text that has seldom been matched, perhaps never’ in any edition of Cervantes’ novel.¹¹⁰ The American artist and former Slade professor, Joseph Pennell, praising both Vierge’s consummate skill and originality, wrote that, ‘in the few short years of his working life’, he ‘proved himself one of the greatest illustrators who ever lived’.¹¹¹

Katherine Sherwood, a contemporary American artist, had a left hemisphere stroke in 1997, when she was 44. Her pre-stroke art was somewhat conceptual, even ideological, but her subsequent work, described as raw, intuitive and flowing, feels to her different. She says there is ‘a new ease in my process. I did not feel I had to intellectualize away my every move and an extreme amount of struggle faded away. A freer, more enjoyable state of painting existed far different than in my previous work.’¹¹² David Ross, the director of the San Francisco Museum of Modern Art and former curator of the Whitney, says of her post-stroke work: ‘There

is something more visceral, less intellectual, about these pictures. Her painting now is much better, much more interesting, than before. That's quite miraculous, but it's true.'¹¹³

In 1951, a Bulgarian painter, Zlatyu Boiyadjiev, suffered a severe left hemisphere stroke that robbed him of speech and paralysed the right side of his body.¹¹⁴ He retrained himself to paint with his left hand in an entirely new style, with elements of naivety, but greater vitality. While these matters are inherently subjective, it has been said of the impact of his stroke that 'all his mature and more famous works came thereafter',¹¹⁵ that 'although his style was entirely new, it was in no way inferior to his pre-stroke style: contemporaries spoke of the birth of a new painter';¹¹⁶ and that 'most of his more highly regarded paintings were executed with his left hand'.¹¹⁷ In 1961 a solo exhibition was a *succès fou*. The young critic Atanas Patsev, a member of the new generation of artists himself, reviewed it with enthusiasm: 'From the canvases there flows tension, love, power, in all the colours of the rainbow. This exhibition is not an ordinary event in our artistic life. This is an epic of human will, imagination, art.' An exhibition of his paintings in 1968 was so 'astonishing and breathtaking' that he was nicknamed 'golden Zlatyu' (*zlatyen Zlatyu*, a pun on his name).¹¹⁸ He went on to win the National Prize for painting, the Vladimir Dimitrov Award.

An Italian painter Afro Basaldella suffered a left hemisphere stroke in 1971. By 1973 'he resumed painting at a rate comparable to his premorbid years'. However,

Afro developed a very personal compensation strategy: he would hold the brush with his right hand but kept it up and guided it with his left hand. This determined his choice of style with a strong preference for vertical and horizontal lines which would define an area with clear margins and which would then get filled with colours. Art critics interpreted this as a 'return to Neo cubism', but in reality, his artistic production was markedly affected and conditioned by the severe movement limitation of his right hand and right arm. Afro continued using this technique up to the time of his death in 1976.¹¹⁹

Another minor Italian painter, Gianfranco Fasce, had a left hemisphere stroke which impaired his capacity to convey depth, and initially affected his choice of colour, which he later recovered. 'Despite a severe expressive aphasia, he was able to create paintings that are artistically valuable even though they show a marked change compared to his previous works.'¹²⁰

A prominent Polish painter, known only as 'RL', had a left hemisphere stroke at the age of 51, which left him with loss of speech and right-sided weakness. While previously he had preferred abstract art, which frequently included verbal material in the form of letters, names or numbers that he integrated into his paintings, his work changed. Two self-portraits done, with his affected right hand, five months after his stroke reveal remarkable skill. Over the first year, he continued to paint portraits and landscapes and only started to paint more symbolically again after the first year.¹²¹

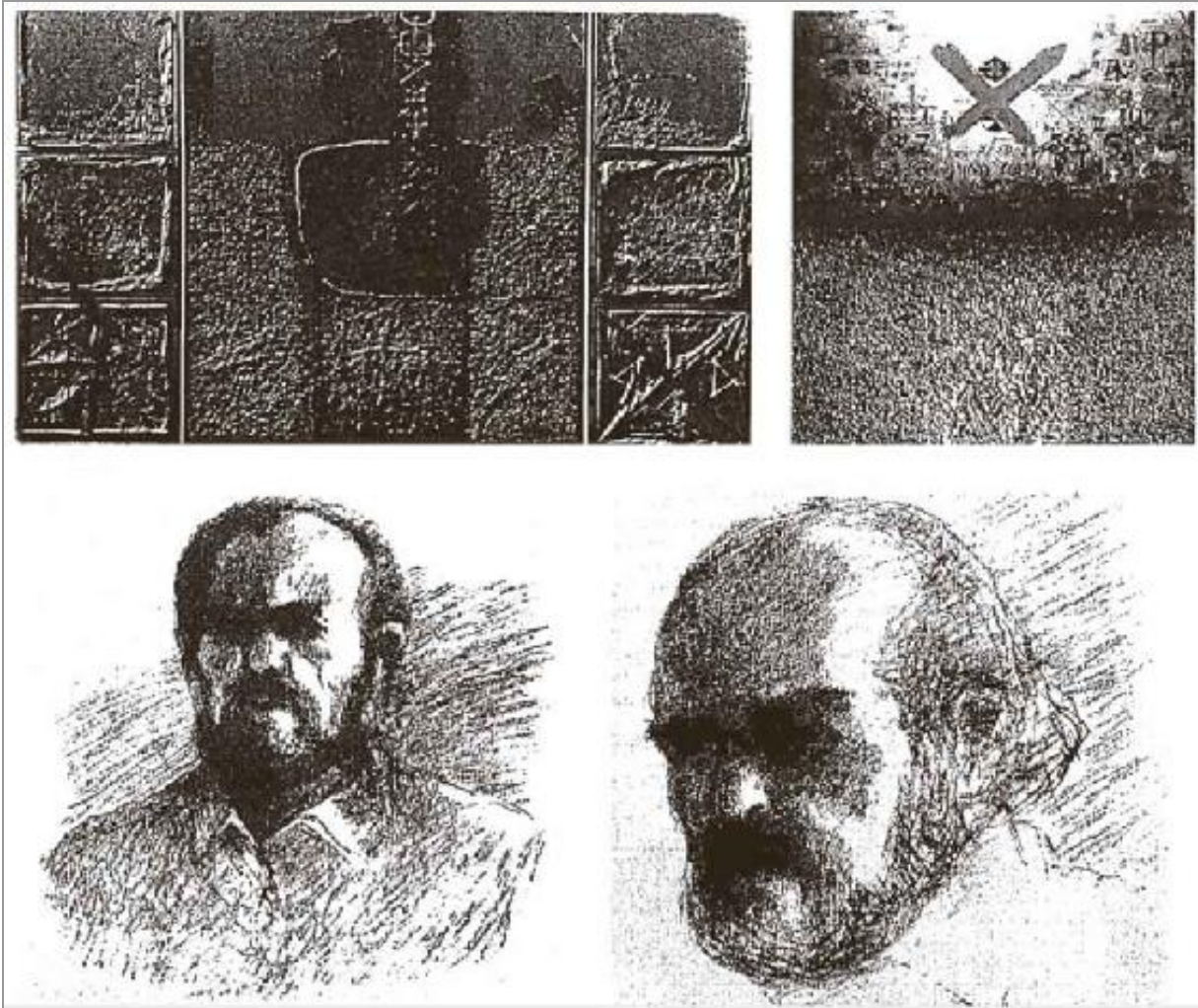


Fig. 21. Change of style in artist 'RL' following left hemisphere stroke. Top row: pre-stroke paintings. Bottom row: self-portraits five months after left hemisphere stroke (from Blanke 2007)

Carl Fredrik Reuterswärd, a Swedish painter and sculptor, had a left hemisphere stroke at 55, but a year later he had resumed intensive artistic activity using his left hand. 'The pictorial works were reviewed by several renowned art specialists: changes of style and even of content were judged without loss of artistic quality. The result was described as a gain in emotional and artistic intensity.' The case is reported by Françoise Colombo & Gil Assal who comment that

although both cerebral hemispheres are important for graphic competence, the right hemisphere plays a dominant role for this

ability ... [aphasics] are able to continue their career with remarkable creativity in spite of aphasia and with the other hand. In all observations of left-hemisphere-damaged aphasic artists a change of style is described as having above all an increase in emotional intensity, which in the case of [Reuterswärd] was confirmed by several renowned art critics. ¹²²

Jean-Marie Annoni and colleagues report two ‘professional’ painters whose creativity was altered by left hemisphere strokes, one in a predictable fashion, the other less so. ¹²³ They both continued to paint, but in styles that in each case differed from their pre-stroke idiom. One (ambidextrous) patient migrated, predictably, from a ‘figurative’ style to a more ‘realistic’ one:

He reported that he was ‘more sensitive to the hidden beauty of nature’ and that he ‘wanted to live and paint spontaneously, explore the world, and represent it in its raw strength’. He also indicated a loss of interest in ‘impressionists’, whom he had preferred for the previous 21 years. Impressionism was now no longer sufficiently real or representative of his creative strength. Intriguingly, he said that it was the use of the left hand that led him into this new artistic dimension ... He realised that his creativity was increased by the use of his left hand.

In the other patient, however, although details were ‘simplified’, as one might expect with a left hemisphere stroke, his style became more abstract and symbolic. ¹²⁴

An improvement in technique was noticed in another painter as dementia progressed, a development which, according to the authors of the study could be related to ‘sparing and disinhibition of the right posterior neocortex’. ¹²⁵ Creativity resulting from disinhibition of the right hemisphere by suppression of the left is proposed by Kenneth Heilman, an authority in the field, in a recent review. ¹²⁶ Another survey by the neurologist Geoffrey Schott concluded that, in at least some cases, compensatory changes particularly in the right posterior hemisphere were ‘likely to be pivotal in enabling unusual artistry to emerge’. ¹²⁷

Then there are reports of sudden acquisition of artistic skill following a left hemisphere, but not a right hemisphere, stroke in people who were not artists prior to the stroke. It is hard, however, to know if they had some latent, or unpractised, skill. Was the artistic ‘release’ really arising *de novo*? And, if not, what does any alteration in style tell us? A subject with left prefrontal stroke showed sudden enhancement of artistic skills in realistic painting after the onset of brain damage. Although neuropsychological tests revealed impaired executive function, he performed better than age-matched healthy controls, and the results were paralleled by increased perfusion in the right parietal cortex, including the precuneus and intraparietal sulcus.¹²⁸ Jon Sarkin, a previously rather reserved chiropractor, was seized after a left brain haemorrhage by an insatiable desire to paint, on any surfaces that presented themselves, a desire which took over his life. He said he saw things differently and more vividly than he had before.¹²⁹ In a study of a subject with epilepsy, who became creative after left hemisphere seizures, the authors suggest that artistic tendencies were released by left frontal dysfunction, leading to right hemisphere dominance.¹³⁰ Anne Adams, a cell biologist, is said to have had a passing interest in drawing when she was younger, but never pursued it. As she developed primary progressive aphasia, a degenerative disease affecting the language centres of the left hemisphere, she gave up her scientific career and began to paint prolifically. According to a neuropsychological study, she made ‘striking gains of function’: brain scans revealed increases in both grey matter volume and vascular perfusion in right posterior cortical areas known to be involved in integrating sensory and other information across different modalities. The authors suggest that damage to the left inferior frontal cortex can lead to structural and functional enhancements in the right posterior cortex, giving rise to some forms of visual creativity.¹³¹ The quality of neuroanatomist Jill Bolte Taylor’s stained glass work, painting and sculpture increased following her left hemisphere stroke.¹³² A 46 year-old truck driver with no previous interest in art started to paint prolifically after a head injury that caused extensive left frontotemporal damage.¹³³ His style evolved through four phases of increasing sophistication.

Mazzucchi *et al* conclude their review of painters following stroke:

Painters with right-hemisphere lesions tend to show a much greater deterioration [than those with left hemisphere lesions]. They also may become unable to represent tri-dimensionality, tend to show greater loss of depth and distance, and also an impoverishment in the use of colours. Their main problem, however, is visuo-spatial in nature, leading to [neglect of] the left side of the canvas or imbalances between left and right side of the canvas. There is also evidence of constructional apraxia. How can our data be interpreted in view of our current knowledge of hemispheric specialization as gathered from split-brain patients? They certainly do not lend support to a narrow or exclusive link between art and the right hemisphere, as sometimes expressed in the popular media ...¹³⁴

Well, maybe not as expressed in the popular media. But why fight shy of the obvious? As she says, ‘our data lend support to the view that the left hemisphere tends to apply piecemeal, analytic, and logical computational approaches to the creative process. The right hemisphere mainly has a global holistic approach and has a high degree of specialisation for visuo-spatial abilities.’ Given the weakness of applying piecemeal, analytic, and logical computational approaches to the creative process (see below), the necessity of a global approach, and, in the visual arts at least, of the right hemisphere’s ‘high degree of specialisation for visuo-spatial abilities’, why not just say it? I suspect because of the fear of being taken for one of those simpletons who believe hemisphere differences are of crucial importance.

Dahlia Zaidel has crusaded against the idea that creativity is in any way hemisphere-dependent, and she is absolutely right to warn against jumping to conclusions on the basis of hemisphere damage in visual artists alone, for the reasons I have outlined. She writes of a too early – I agree – adoption of the idea that the right hemisphere ‘specializes in producing and aesthetically reacting to art.’ But it might be somewhat premature, too, to dismiss the possibility. ‘Unfortunately’, she continues, ‘the assumption became prevalent, and eventually was challenged. Indeed, close examination of the artworks of artists with brain injury revealed otherwise.’¹³⁵

In support of this claim she names six sources. Two are her own previous assertions on the subject, which do not take the argument much further.¹³⁶ Two show the remarkable preservation of quality in artists’ work

following *left* hemisphere stroke, which is interesting, but not to her point.¹³⁷ A further paper shows that, after right hemisphere stroke, artists' outputs were altered, but leaves the question of creativity untouched, since it is mainly interested in neuropsychological changes in the visuo-spatial system;¹³⁸ and the last is the paper by Bänzner & Hennerici, which I have already quoted, showing the damaging impact of right hemisphere stroke.¹³⁹

Somewhat briskly, given the problems we both see here, Zaidel writes, 'The current view is that both hemispheres are involved in the creative process and that there is no hemispheric specialisation for creativity *per se*'.¹⁴⁰ But it is not that easy to settle the matter. Both hemispheres are to some degree, in some fashion, involved in everything, as I have repeatedly stated. But that doesn't address the issue of specialisation. She cites two literature reviews in support of her statement, those by Lindell and Mihov. But these are not references that will help her case. Lindell, as we shall soon see, while suggesting that both hemispheres are involved in creativity, concludes that taken as a whole EEG research 'indicates a marked increase in right hemisphere activation during creative tasks ... The research reviewed here suggests that the right hemisphere does play a greater role in creative processing than the left ... there is no question that the right hemisphere plays a critical role in creativity.'¹⁴¹ And we have already seen that Mihov, who also reviews the research to date is hardly a good choice of ally, observing, as he does, that 'researchers of the lateral dominance have, with fair certainty, come to the conclusion that the right hemisphere and its regions are specialized for creative tasking', and that there is 'dominance of the right hemisphere during creative thinking'.¹⁴²

Over this whole area hangs the ambiguity of the word 'specialise'. It's the surgeon and the scrub nurse again. Each works with the other, rarely if ever apart – true enough. And yet one does not normally conclude that the scrub nurse rather than the surgeon actually carried out the operation. It might even be possible, after many years of working together, for them to exchange roles briefly in a crisis, if the surgeon were injured. 'Scan' the theatre to find out who is operating, and you'll come off none the wiser, since there are usually several different actors involved in the key area. Does 'specialise in' mean 'is *exclusively* involved in'? After all, we will never learn anything about hemisphere differences if we wait for a situation in which one hemisphere is 100% responsible for whatever it is, and the

other contributes nothing. It is always a matter of degree – a matter of asymmetry. And when phrases such as ‘marked increase’, ‘greater role’, ‘critical role’, ‘dominance’, ‘with fair certainty ... specialised’, are applied to one hemisphere and not to the other, they convey to me that that required degree, whatever it is, has been reached. But that’s just my judgment.

Relevant here is a paper by Zaidel about the artists Braque and Kokoschka, both of whom sustained head injuries in the First World War. Braque sustained the more serious wound, in the left hemisphere, but after a recovery period, returned to his art, in Zaidel’s words, ‘seemingly unscathed’. In Kokoschka’s case, he is assumed to have had a right hemisphere injury because in the immediate aftermath of the wound he describes his right hand as ‘the one that wasn’t paralysed’.¹⁴³ The site of the bullet wound is not mentioned, and ‘no mention of neuropsychological right hemisphere symptoms appears in the writings about him by others or in his own observations of himself’, as Zaidel says. ‘Whatever the nature of brain tissue damage caused by the bullet, it did not hamper his artistic talent and skills.’

The least one can say is that if nothing here establishes the key role in creativity for the right hemisphere, nothing here rules it out, either, and we’ve got the rest of the chapter to go.

Right hemisphere strokes are much more serious for painters and sculptors, because of the visuo-spatial nature of their work, but it seems not to be simply a matter of the medium. What do we know about left hemisphere stroke in composers?

Composers

There are a number of cases of composers suffering left hemisphere strokes without impairment, and indeed, according to some sources, with renewed creativity, though the assessment is inescapably subjective.¹⁴⁴ Benjamin Britten suffered a left hemisphere stroke in 1973 during a valve replacement operation, affecting the use of his right hand and leading to depression. Yet his creativity was by common consent, unimpaired,¹⁴⁵ and according to one source, the critics are ‘unanimous’ in describing his Third String Quartet, his last major work, written in 1975, two years after the stroke, and completed just before his death, as ‘a masterpiece ... worthy of

comparison with the last string quartets of Beethoven'.¹⁴⁶ My verdict, too. His biographer the composer David Matthews wrote of it that 'the two earlier quartets had been among his finest instrumental works; the Third is their equal in invention, and in range and depth of expression their superior'.¹⁴⁷

Jean Langlais had a burst of creative composition after a left hemisphere stroke in 1984 that had left him initially speechless, and depressed. The works were 'fresh', but 'uneven' in quality.¹⁴⁸ Igor Stravinsky had a left hemisphere stroke in 1956 at the age of 74: he composed more in the following decade than he had in the 1930s and '40s together.¹⁴⁹ His ballet *Agon*, finished the year after his stroke, was his first twelve-tone composition; despite this novelty, it was 'greeted with wild acclaim' on its first night (partly, it has to be admitted, because of the sensational choreography by Balanchine), and is considered one of the greatest successes of his entire career.¹⁵⁰

Vissarion Shebalin had a mild left hemisphere stroke in 1953, and a much more severe one in 1959, neither of which stopped him producing masterpieces: Shostakovich said of his Fifth Symphony, composed in 1965, that it was 'a brilliant creative work ... a creation of a great master'.¹⁵¹ His work remained, like Stravinsky's post-stroke music, innovative and adventurous, and 'with a new richness and depth',¹⁵² with fewer 'inhibitions and influences'.¹⁵³

Alfred Schnittke had his first left hemisphere stroke in 1985, aged 50, and it left him in a coma. He was declared clinically dead on more than one occasion, but recovered and carried on composing with undiminished energy. After this and before his second stroke six years later, in 1991, his output was 'three times greater' than it had been before the stroke. After the second stroke and before his third stroke in 1994 it was 'astounding'. He said it was 'as if I can visualise the final shape of [the] piece while previously I would see something more or less suitable'. He reported a reduction in analytic processing and an increase in intuition: he considered this a positive development for his composition. He referred to his post-stroke period as 'life after death', or a 'second circle of life'.¹⁵⁴

And, perhaps of some interest, both Handel and Bach are thought to have suffered a left hemisphere stroke, after which their composition was in no way inferior, and arguably superior.¹⁵⁵

There are even cases of those who, after a left hemisphere stroke, developed a sudden interest in and understanding of music, again as though something had been released. One subject who was not particularly musical previously became 'hypermusical' following a left hemisphere stroke.¹⁵⁶ In his book *Musicophilia*, Oliver Sacks reports similar cases, all following left, not right, hemisphere damage.¹⁵⁷

'By contrast', according to Yuri Zagvazdin in his apparently exhaustive review of the literature, 'descriptions of cases in which composers had right-hemispheric stroke are difficult to find.'¹⁵⁸ He mentions only two. Engelbert Humperdinck recovered and wrote some music, helped by his son, after a right hemisphere stroke, of what creative status, it is hard to say; another composer, however, 'lost his ability to create music as a result of his right frontoparietal and posterior temporal cerebrovascular lesions'.¹⁵⁹ Two cases overlooked by Zagvazdin involving right hemisphere stroke are known to me from the literature. Tedd Judd reported a composer who was a music teacher: after his right hemisphere stroke, he went back to teaching at around three months, and after a year had resumed conducting an orchestra. However, his musical output remained very limited, despite efforts to continue composition.¹⁶⁰ And Howard Gardner reported the case of a young composer, a lecturer at a conservatory, who after a right hemisphere stroke remained knowledgeable about music and carried on in his teaching post satisfactorily, but lost interest in composing.¹⁶¹

The case of Maurice Ravel is tragic. He had a degenerative brain disease the nature of which is speculative, and which resulted in his losing his speech. It appears to have affected his left hemisphere considerably more than his right. According to neurologist Richard Cytovic this

revealed a right-sided cognitive system that was disconnected from the capacity to 'translate the patterns which were his music into symbols'. He was 'able to "hear the music in his head"' but had 'an inability to "get out" what his right hemisphere had created'. The loss affected him bitterly. He died after an exploratory operation which found no structural abnormality.¹⁶²

These were painters and composers. But what happens to those, such as poets, for whom language is their creative medium?

Poets

The poet William Carlos Williams first suffered a left hemisphere stroke in 1951, at age 68, and then a further subsequent one a year later. The second stroke resulted in paralysis of his right arm, a visual field defect, an expressive speech impairment, and word-finding difficulties. Despite his language problems, for the remaining 11 years until his death he continued to write poetry prolifically. The poems he wrote following the strokes are deemed amongst his finest work. His creativity and skills as a poet were unaltered and he went on to receive the Pulitzer Prize.¹⁶³

Similarly, in 1990, the well-known and highly regarded Swedish poet Tomas Tranströmer lost his speech and the ability to use his right hand after an extensive left hemisphere stroke. In spite of a severe non-fluent dysphasia with dysgraphia (in other words, both speaking and writing became for him difficult and halting), Tranströmer kept producing poetry of the highest calibre. He carried on playing the piano with his left hand and enjoying music. And through music and poetry, he overcame the communication problems imposed by his stroke. He was never a writer of long poems, but following his stroke Tranströmer's style became even more terse and telegraphic, and densely connotative, in a manner reminiscent of the *haiku*.¹⁶⁴ In 2011, 21 years after his stroke, he was awarded the Nobel Prize for literature.

Walt Whitman suffered a series of strokes, some of which affected his left hemisphere and some his right hemisphere: it is therefore virtually impossible to draw any conclusions from his case.

Semantic dementia (also known as semantic variant primary progressive aphasia, or svPPA) is a degenerative condition affecting primarily the language centres of the left temporal lobe. It is known that semantic dementia can lead to *de novo* creativity in the visual arts, and we have seen an example in Anne Adams. However, a study of three subjects who developed semantic dementia claimed that they all had *de novo* creativity in the verbal domain. Actually, only two of these truly had left- greater than right- disease involvement. Nonetheless these were the ones that actually did show new verbal creativity, while the third, in my view, did not. The first subject reported that 'nature inspired her to write beautiful things'. Previously uninterested in writing, at 56 she compiled a large volume of poems. The second subject became more religious and evinced 'a new

fascination with words manifested as pressured speech, rhyming, frequent punning, and interest in word games and puzzles. He created montages with images and his own poems.' The third subject, however, had greater disease involvement in the right hemisphere than the left: she showed no evidence of increased linguistic creativity, or poetic inclinations of any kind, becoming merely 'extremely verbose' and disinhibited. [165](#)

EFFECT OF LESIONS ON CREATIVE PROBLEM-SOLVING

Fortunately we do not have to rely on ‘experiments of nature’, such as stroke or tumour. Using techniques such as TMS, or another safe and painless technique sometimes used in stroke rehabilitation called transcranial direct current stimulation (tDCS), researchers can get relatively ‘clean’ insights into the contributions of different brain regions to aspects of the creative imagination. One study examined visual memory, known to be vital to creativity, in 12 subjects, each in three conditions: (i) the normal state; (ii) with suppression of the right anterior temporal lobe and excitation of the left anterior temporal lobe; and (iii) vice versa. Only those in the third condition, in which the right hemisphere is excited and the left hemisphere suppressed, showed improvements.¹⁶⁶ More intriguingly, by simply suppressing the left frontotemporal region, nearly one-half of subjects can perform new skills, during the stimulation and for a short period after, that they could not perform before, such as, for example, realistic drawing in three dimensions.¹⁶⁷ Other studies have similarly found that just suppressing the left dorsolateral prefrontal cortex increases problem-solving ability,¹⁶⁸ facilitates the making of remote associations,¹⁶⁹ enhances the flexible generation of unusual uses for objects,¹⁷⁰ and enhances visuo-spatial creativity.¹⁷¹ Deactivation of the left and activation of the right prefrontal cortex was associated with increased creativity in all domains studied: conceptual expansion, associative thinking, and set-shifting ability.¹⁷²

It appears that calendrical calculating autistic savants engage the posterior right hemisphere to solve seemingly impossible maths problems.¹⁷³ Donald Treffert, who has spent his life studying savants, had by 2010 assembled a worldwide registry of 319, of whom 32 had the acquired form. In a paper in *Scientific American*, he reports that in most of these acquired cases, leading to exceptional mathematical, musical or artistic talents, there was damage to the left hemisphere, leading to a release phenomenon involving recruitment and rewiring in the right hemisphere (he calls this the ‘three Rs’).¹⁷⁴ Savant syndrome is usually associated with a knockout of the left frontotemporal area, whether by birth, or by accident,

or by TMS.¹⁷⁵ And as if to confirm this, a mathematical prodigy was found to be activating mainly right hemisphere prefrontal and temporal areas:

calculation expertise was not due to increased activity of processes that exist in non-experts; rather, the expert and the non-experts used different brain areas for calculation. We found that the expert could switch between short-term effort-requiring storage strategies and highly efficient episodic memory encoding and retrieval, a process that was sustained by right prefrontal and medial temporal areas.¹⁷⁶

One of the oddest examples of savantism is that of a nine year-old Mexican boy who in a robbery sustained a bullet wound to the left hemisphere so severe that for two years he was mute, deaf, and paralysed on the right side. When he regained speech, he had ‘completely shed the dialect of the region of his birth’. Despite studying hours a day, he was unable to learn more than a few phrases in English, read, write without a model, or do arithmetic. However, he acquired sudden mechanical skill and was able to dismantle, reassemble and modify multigear bicycles, as well as inventing a punch bag that could simulate the bobbing and weaving of a live opponent. Although he had never received any artistic instruction, he was able to copy pictures accurately. ‘One of the most amazing things that he does is a series of tricks with strings and small objects’, we are told. He demonstrates these tricks to others, but no-one else has been able to do them.¹⁷⁷

Convergent thinking is intensified if the left prefrontal cortex is stimulated,¹⁷⁸ and conversely divergent thinking is enhanced by right frontal stimulation.¹⁷⁹ Creative problem-solving is of particular interest because measurement is relatively objective compared with artistic skill. Solving the nine-dot problem is an example. The puzzle presents a regular grid of nine dots: the challenge is to link all nine dots using four straight lines or fewer, without lifting the pen and without tracing the same line more than once.

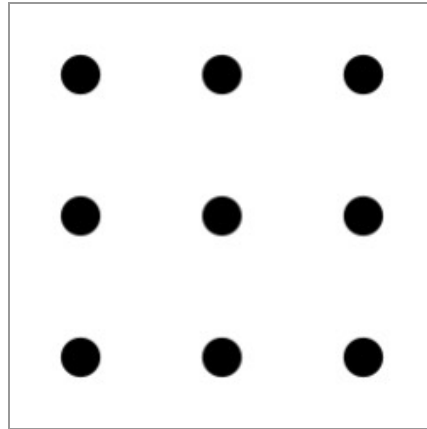


Fig. 22. The nine dot problem

The solution requires a typically right hemisphere insight, since it demands ‘thinking outside the box’. The classic solution is shown later in this chapter.

The majority of studies over the last century found that no participant who has not previously encountered the problem can find a solution within the time span of the test. However, using tDCS, which delivers a constant, low-level current using electrodes placed on the scalp, after 10 minutes of excitation to the right anterior temporal lobe and simultaneous suppression of the left, more than 40% of participants did so. Not one subject did so during sham stimulation.¹⁸⁰

For a long time it has been known that, as mentioned earlier, it is possible to cause temporary excitement of one hemisphere at a time by irrigating the contralateral external auditory canal (ie, the ear canal on the other side) with cold water.¹⁸¹ A more recent development called galvanic vestibular stimulation achieves similar effects using electrical current. Stimulating the right hemisphere in this fashion increased originality, while stimulating the left hemisphere decreased it.¹⁸²

In some degenerative neurological conditions such as Parkinson’s disease, a technique involving the implantation of electrodes in the brain (deep brain stimulation, or DBS) has met with considerable success in treating symptoms. As an associated finding, when the left hemisphere is stimulated, both artistic creativity and appreciation are reduced. When the left hemisphere DBS is switched off, patients’ creativity and artistic appreciation scores are relatively enhanced.¹⁸³ The researchers suggest that

left hemisphere activation results in right hemispheric suppression, thus decreasing artistic creativity.^{[184](#)}

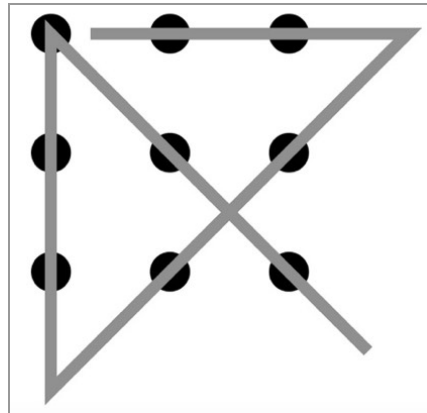


Fig. 23. The nine dot problem: solution

EVIDENCE FROM HEALTHY ARTISTS AND COMPOSERS

Studies have been carried out more directly on healthy artists and composers. Artists exhibited ‘strong right hemispheric dominance’, which was much weaker in non-artists; and this was present not only when they were engaged in a creative task, but when they were directly perceiving or visualising works of art – and indeed when at rest.¹⁸⁵ Another recent study found that in a group of experienced artists, activity in the right prefrontal cortex was high but activity in the left prefrontal cortex, and bilateral posterior cortex, suppressed. According to the authors of the paper, this was in keeping with previous studies of artistic creativity, which ‘all point to right hemispheric dominance, particularly of the frontal area’.¹⁸⁶ Composers activate ‘areas specific to melody generation’ in the right temporal pole and right frontal operculum.¹⁸⁷ In both male and female composers, the compositions that received the highest ratings were by subjects that had smaller left hemisphere advantages in verbal processing, suggesting a greater reliance on the right hemisphere.¹⁸⁸ And while an fMRI study suggested that activity in both the left anterior dorsomedial prefrontal cortex and the right anterior middle temporal gyrus was directly proportional to the creative quality of metaphors, the great preponderance of evidence, which I have reviewed earlier, suggests that of the two, the right middle temporal gyrus is the more significant, despite the verbal nature of the task.¹⁸⁹

It seems that creative individuals do have different patterns of brain activity, even when not actively engaged in a creative task. According to one study,

insightful individuals show greater right hemisphere activity at rest, relative to analytic individuals ... The fact that an insight-related hemispheric difference can be found in the resting state suggests that the functional hemispheric asymmetry occurring during problem solution may have its origin in structural hemispheric differences.¹⁹⁰

Such differences include the cytoarchitectonic differences described earlier in this chapter.

Insightful individuals also show larger and more diffuse activation of the visual cortex compared to analytical individuals, even when the resting-state EEG is performed with the eyes closed.¹⁹¹ If it is true, and it seems to be, that work is constantly ‘incubating’ in highly creative minds, particularly analogical, visual or *Gestalt* thinking, this would make sense, since they are not creating only when overtly engaged in a task.

Such individuals may generally have more diffuse and outwardly directed attention, write John Kounios and Mark Beeman, two of the best known names in creativity research,

but successful insight solving involves transiently redirecting attention inwardly during the preparation for and solving of a problem. It therefore appears that the tendency to solve problems insightfully is associated with *broad perceptual intake* as the default mode of resting-state attention deployment, coupled with the tendency to focus *inwardly* in preparation for, and during, solving. In contrast, analytical people’s resting-state attention is less outwardly focused during the resting state and less inwardly directed during preparation and solving.¹⁹²

The capacity for both ‘broad perceptual intake’ and outwardly directed attention is greater in the right hemisphere; and so it is for internal visualisation, as we shall see.

CREATIVE THINKING STYLES

There is, then, a considerable body of evidence from naturally occurring, or temporarily experimentally induced, lesion studies, from direct observation of creative artists, and from a host of different kinds of experimental studies, that quite consistently suggests not just that depressing the right hemisphere tends to depress creativity, including originality, flexibility and divergent thinking, but that depressing the left hemisphere enhances creativity, probably because the mind is released from tendencies towards the linear, explicit and linguistic modes of apprehension typical of the left. There is in fact direct evidence that both rationalising and verbalising have a damaging effect on creativity, at least during the generative process itself. The evidence on this matter is detailed in Chapters 17 & 18. However, an fMRI study at Stanford is particularly interesting. Not only did it find a negative correlation between creativity and involvement of the left prefrontal cortex, it also found that greater involvement of the cerebellum improved creative problem-solving.¹⁹³ Since the cerebellum is entirely unconscious, and involved in sensorimotor co-ordination, this confirms both that the unconscious mind and the body play an important role in creativity, and that thinking is not separate from perceiving, feeling and bodily motion (a topic I will return to when I discuss the cerebellum in Chapter 23).

In many situations, the effort to reduce mistakes may potentially interfere with the achievement of insight by limiting time and resources and by directing attention toward precision, and away from reflection. The effort at reducing mistakes – the documentation of sources and of areas of uncertainty, and the assignment of probabilities to assumptions – can get in the way of apprehending new patterns.¹⁹⁴ Chrysikou and colleagues write that:

An extended body of research supports the notion that a particular region of the PFC, the left ventrolateral prefrontal cortex, is implicated in tasks that ... are guided by a set of explicit rules and ... require one correct response, the form of which is typically known to the participants.¹⁹⁵

It's also not just a matter of the convergent approach being uncreative, but of its positively leading to a certain kind of mistake. Insight can be mistaken, but so can analysis.¹⁹⁶ Subjects who solve predominantly by insight tend to make errors of omission ('time-outs') rather than errors of commission (incorrect answers); those who solve analytically make the reverse pattern, giving incorrect answers, rather than failing to complete. When confronted with a deadline, insight solvers will simply not complete the task if the answer has not come in time. However, when analytic solvers run out of time, they tend to guess, often incorrectly, before the deadline, offering the hypothesis they were busy evaluating at the time.¹⁹⁷ Don't forget that, to put it bluntly, the left hemisphere is overconfident and is prone to bullshit.

Creative intuitions frequently begin with *not* knowing, with the recognition that the obvious does not apply, that something here does not fit. If you are engaged in narrowing down to the most likely, are less inclined to doubt what you believe you know, and are inclined to preserve the current paradigm at all costs, rather than take seriously a finding that requires its modification, it is clear that you will be less likely to find something new – or accept it when it is pointed out to you.

EEG studies of creativity

EEG studies are another source of information on creativity, but, like imaging studies, they suffer to some degree from problems of interpretation if taken on their own. Nonetheless, a number of EEG studies suggest greater right hemisphere activation in both divergent thinking tasks and in insight tasks, very few suggesting the opposite.¹⁹⁸ A sentence generation task, starting from just four letters, produced significant activity in both frontal lobes, but additionally in the right, but not left, parietotemporal region (note that this is a language-based task, which necessarily involves the left hemisphere).¹⁹⁹ In two types of divergent thinking tasks, the posterior regions of the right hemisphere displayed higher involvement than the left in both conditions.²⁰⁰ One study found (although the results were far from straightforward) a relationship between the right hemisphere and both intelligence and creativity that has been found elsewhere: 'high IQ individuals showed more co-operation between brain regions in the right

hemisphere during divergent thinking tasks.’²⁰¹ In another study, in successful cases of insight ‘gamma band power was increased in right fronto-central and frontal electrode.’²⁰² Annukka Lindell, in a recent systematic literature review, concludes that taken as a whole EEG research ‘indicates a marked increase in right hemisphere activation during creative tasks’. ²⁰³

Neuroimaging studies of creativity

With all of this in mind, let’s look at the imaging literature briefly. A recent study claims to offer ‘unprecedented empirical support for a crucial and specific contribution of the right hemisphere to creativity’.²⁰⁴ Several imaging studies suggest that the right prefrontal cortex has a special role to play in ‘open-ended’ inference tasks with no right or wrong answers.²⁰⁵ A study of divergent thinking found that the right, but not left, dorsolateral prefrontal cortex was activated, consistent, as the authors remark, ‘with a number of earlier studies which also found predominantly right-sided activity during divergent tasks’.²⁰⁶ A study of the neural correlates of creative writing as compared with copying showed that ‘all regions showed lateralized activity to the right hemisphere’, with the strongest activation in the right medial temporal pole. ²⁰⁷ A study comparing an artist with a non-artist drawing a portrait found that while both showed an increase in activity in the right posterior cortex, a region normally associated with facial perception and processing, ‘the skilled artist showed greater activation in the right frontal area’.²⁰⁸ In a design task, the creativity of experts was proportional to the degree of dominance of the right prefrontal cortex over the left. The results suggested that there was a direct, suppressive, effect on the left parietal cortex, while the activity of the right prefrontal cortex was facilitated. In expert artists only the right prefrontal cortex and right parietal cortex were activated, whereas in the novice group the activations were bilateral: it was suggested by the authors that in artists a transcallosal pathway was exerting inhibitory control of the right on the left prefrontal cortex.²⁰⁹

TOGETHER OR APART?

That raises the interesting question, whether it is co-operation, or independence, of the hemispheres that leads to creative excellence. In her review, Lindell emphasised that the whole brain is involved in everything (granted):

Although the research reviewed indicates greater right hemisphere activity during creative tasks, the interaction between many varied, often distant, cortical regions across both the left and right hemispheres is also a crucial component of creativity. This interaction facilitates the integration of a variety of separate cognitive abilities, fostering creative thinking ... Interhemispheric interaction would clearly be valuable here as the integration of information from both the left and right hemispheres via interhemispheric interaction can bring together more distantly related semantic concepts than if a memory search were theoretically restricted solely to one region or one hemisphere.

On the face of it this assumption – which is all that it is – seems reasonable. Why would a process that depends on bringing things together not produce best results when both halves of the brain are integrated?

But what if you were not trying to integrate two elements, each of them itself integrative, but trying to integrate an integrative element with an analytic one? It has been claimed that interactions between visuo-spatial and analytic thinking, and between conscious and unconscious thought processes, are necessary for creativity.²¹⁰ But this is a half-truth. At the generative stage, it is important that they are kept apart; all the evidence is that premature involvement of conscious, analytic thinking stops creativity in its tracks. At some stage the results of the generative process can be subjected to linguistic formulation, conscious inspection and analysis, *provided* those factors have been kept at bay until creative generation is far advanced.

This is important because it underlies the impression that Lindell gives – and others give – of doing the mental splits. On the one hand, they see

clearly that the right hemisphere is the key factor; yet, on the other, common sense (and an instinct for self-preservation) seems to tell them that things ‘must’ be better if both hemispheres are involved. Thus she says: ‘The research reviewed here suggests that the right hemisphere does play a greater role in creative processing than the left ... there is no question that the right hemisphere plays a critical role in creativity’; but she concludes, on less evidence, that the left hemisphere is also ‘vital’.

However, we have already seen that the right hemisphere performs much better when not open to interference from the left hemisphere. Several studies have separately found that there is more ‘decoupling’ and independence of the hemispheres in creative individuals.²¹¹ In a study of corpus callosum size in relation to creativity, there was found to be an *inverse* association, ie, smaller callosal size was associated with higher creativity.²¹² This may be because decreased interconnectivity enhances hemisphere specialisation, which in turn benefits the incubation of ideas that are critical for flexibility, divergent thinking, and originality.²¹³ There needs, however, to be some connectivity, even if only to allow a degree of inhibition, and a degree of access to the left hemisphere’s language repertoire: total callosal agenesis (failure to develop) appears to diminish creativity.²¹⁴ There will be a need for both inhibitory and facilitatory connexion at different points in the process.²¹⁵

One rather nice detail suggests that relative hemispheric independence may be a part of genius, at least in some cases: one of CS Peirce’s accomplishments was that he could write down a question which was bothering him with one hand, and with the other simultaneously write the answer.²¹⁶ Perhaps Leonardo’s brain was similarly flexible: he could write, mirror fashion, with either hand, or both at once.²¹⁷

In summary, to quote Waismann, there is something

so wrong with the whole way in which such discoveries [scientific, philosophical or artistic] are so often presented – as if they were the result of a ‘method’ or ‘procedure’, as if the great men arrived at their solutions by drawing logical inferences. This leaves out the most essential thing– the flashing of a new aspect which is *non*-inferential. The moments of seeing cannot be foreseen, any more

than they can be planned, forced, controlled, or summoned by will-power.^{[218](#)}

THE GENTLE ART OF DEBUNKING

This review of evidence may seem to have been somewhat repetitive. That is because I need to establish just how extensive and multifaceted the evidence for right hemisphere superiority in creativity is. And here's why. Despite this extremely substantial body of findings of many different kinds gathered over many years, it has been suggested, rather in the face of reason as well as of the evidence, that critical and convergent thinking, eliminating error and aiming for the one correct answer, might be creative; and this goes with a denial that the right hemisphere plays the predominant role, or even an important role at all, in creativity. The assertion is usually made in passing, almost a ritual utterance that absolves the faithful scientist from being tainted with the mortal sin of taking hemisphere differences too seriously. But there is one influential and insistent such voice, that of Arne Dietrich at the American University of Beirut, who has taken the trouble to marshal an argument in detail in a well-known scholarly paper, followed up by a full length book, 'debunking', as he jauntily puts it, a range of 'myths' about creativity, the most prominent being that of the special role of the right hemisphere. I am therefore obliged to take a closer look at the evidence he cites, to see if he is right about this.

The paper was written in conjunction with a colleague, Riam Kanso.²¹⁹ In it the authors review 63 papers on divergent thinking, creativity and insight. They begin by casting doubt on the whole idea that divergent thinking is of particular relevance to creativity. As I have already suggested, I agree that studies of divergent thinking – how many uses can you think of for a tin can? what's the word that links BREAD, GRAPE and CAKE?²²⁰ – are a poor substitute for what's done by Shakespeare or Mozart. But to the extent that being creative means having the originality to see something new, it can't be done by convergent thinking in itself (though that may play a subsequent, auxiliary, role). You can't be creative by just following the usual rules.

Not so according to Dietrich & Kanso. 'It is obvious at a moment's reflection – and certainly was to Guilford himself', they write:

– that creativity can just as well be the result of a convergent process. What would we otherwise make of Edison’s assembly line, nearly algorithmic approach to inventing; Bach’s methodical way of composing hundreds of cantatas; the imaginative ways in which National Aeronautics and Space Administration engineers solved the problems of the otherwise doomed Apollo 11 mission; or the countless creative solutions generated by systematically eliminating alternative possibilities?

In another paper Dietrich goes further: ‘Once we understand that creative acts arise from both divergent and convergent processes, the distinction becomes meaningless as the theoretical basis for the study of creativity.’ ²²¹ Really, meaningless? I’m in favour of more, rather than fewer, distinctions myself, when it comes to understanding creativity, and it seems a bit incautious to sweep such a basic one out of the way. It doesn’t particularly matter what Guilford thought. However, since the matter is raised, Guilford saw, yes, that we need both divergent and convergent thinking; but he thought, as most people do, that convergent thinking had its place at a later stage, after divergent thinking had played its part (and that our educational system was wrong to encourage convergent thinking at the expense of divergent thinking).

Dietrich & Kanso also confuse problem-solving with creativity. Not all problem-solving is creative. Marshalling and analysing data for your tax return requires convergent thinking to solve the problems set by the Revenue Service’s demands, but, outside of criminal circles, it is not widely held to be a creative activity. However, establishing the existence of Fuchsian functions required jettisoning convergent thinking – here is Henri Poincaré’s famous description:

For fifteen days I strove to prove that there could not be any functions like those I have since called Fuchsian functions. I was then very ignorant; every day I seated myself at my work table, stayed an hour or two, tried a great number of combinations and reached no results. One evening, contrary to my custom, I drank black coffee and could not sleep. Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination. By the next morning I had established the existence of

a class of Fuchsian functions, those which come from the hypergeometric series; I had only to write out the results, which took but a few hours.

However, once their existence has been established, working with Fuchsian functions *does*, right enough, involve, for you and me, convergent thinking. But not until the discovery – the creative element – is made. Inventing the bagless vacuum cleaner involved James Dyson in making a connexion between an air-filtering system used in sawmills and oil refineries, called an industrial cyclonic separator, and a domestic floor cleaner: divergent thinking. It then took him and his team 15 years and 5,127 attempts, once the insight had been had, to build it: mainly convergent thinking.²²²

And what of Edison, Bach and Apollo 11? Of course, inventions don't come without application of effort, and are often tweaked or incrementally improved, but it would be silly to suppose that they are merely the product of following rules, systems or procedures. 'The creative mind is a mind that looks for unexpected likenesses', wrote Jacob Bronowski. 'This is not a mechanical procedure, and I believe that it engages the whole personality in science as in the arts.'²²³ Nor is mathematics a matter of following procedures. 'Math is not about following directions, it's about making new directions,' writes mathematician Paul Lockhart:²²⁴

To do mathematics is to engage in an act of discovery and conjecture, intuition and inspiration; to be in a state of confusion – not because it makes no sense to you, but because you *gave* it sense, and you still don't understand what your creature is up to; to have a break-through idea; to be frustrated as an artist; to be awed and overwhelmed by an almost painful beauty; to be *alive*, damn it.'²²⁵

Edison was right that hard work counts and he was relentless in experimentation, but his experimentation was guided by insight. Edison is one of the few people to have had a light bulb moment about light bulbs, but he did have one. 'Of course Edison's most famous invention was the light bulb', writes Wouter Boon, author of *Defining Creativity: The Art and Science of Great Ideas*:

Though electric lights had already been invented to light the streets, Edison introduced it into people's homes. To do so he needed to bring together a wide range of knowledge about the light bulb itself, the fixtures, the electricity generators and the circuits getting the electricity from the power station to the homes. It was like a big puzzle, he had to combine all the pieces into one invention. *Making unfamiliar combinations of familiar ideas; that is what creativity is in a nutshell* ... The idea of using bamboo as the light bulb filament came from Edison's memory ... Making associations with our memory is very important for being creative, since it allows us to use 'old' ideas in new combinations ... Edison didn't attend public school for very long. One of the reasons was that his mind often wandered. This made him unfit for the traditional schooling system. Edison did take naps. Whenever and wherever he needed them – even on his workbench. This wasn't the only way he recharged his batteries. The laboratory had a pipe organ at the back and often around midnight Edison himself would play it and everyone would sing along and have a drink. Generally, it is important for creative minds to find relaxation. This not just suits the purpose of recharging the batteries, but it is also important for incubation, the phase in the creative process during which the acquired knowledge gets a chance to sink in, be reorganized and combined with other (seemingly irrelevant) ideas by the unconscious brain.²²⁶

Or Bach. Was his really just a methodically 'convergent' mind, finding the one, clearly right, solution by following the established procedures – what Dietrich elsewhere refers to as Bach's 'assembly line tactic'?²²⁷ To anyone who knows the first thing about Bach, this is a very odd idea indeed. He wrote regularly, as did Shakespeare and Mozart, but this does not mean that he, or any of them, followed an 'assembly line tactic'. We don't need to rely only on our own twenty-first-century judgment – after all we might be committing the unforgiveable sin of 'romanticising' – we can turn to what his contemporaries thought. Johann Birnbaum, a professor in rhetoric at Leipzig who died two years before Bach, praised 'the astonishing mass of unusual and well-developed ideas' in Bach's music. 'This does not refer', according to Christoph Wolff, the eminent musicologist and Bach's biographer, 'to traditional invention, guided by an

art of devising melodies and themes, one governed by musical rhetorical models.’²²⁸ Bach’s obituary speaks of ‘strange ideas’, and describes his melodies as ‘uncommon’, ‘always divergent’ (two centuries before Guilford!), and ‘fanciful ... unlike that of any other composer’.²²⁹ Speaking in 1784 or 1785, the composer Christian Schubart wrote that ‘there is no mistaking the originality of Bach’s genius ...’²³⁰ So great was his genius that even composing to a schedule did not blunt it.

The myth that the idea of the creative genius has been debunked is well overdue a bit of debunking of its own. David Cope developed a way of analysing enormous numbers of Bach fugues so as to gather some generative forms that his machine EMI (Experiments in Musical Intelligence) could then use, *retrospectively*, to copy Bach. But, as we have seen, Bach’s genius was not itself a copy. And Bach’s feeling, his spirit, the human meaning of his music matter more than any structural elements taken out of that context: again a machine could only achieve a simulacrum of something that would, had it come from a human, convey feeling, and then as an incidental occurrence in one out of many, many attempts. That, however, was not Bach’s method. Already by the age of 19 Bach had composed a piece of music so deep, so moving, that no machine could ever begin to rival it.²³¹ And it was also, already, quite original.

Mozart is often trotted out as one of those who achieved what he did by conscious application unaided by unconscious or divergent thinking, as for example in Robert Weisberg’s deeply flawed book *Creativity: Beyond the Myth of Genius*. Weisberg effectively denies that highly creative people make ‘mental leaps’, asserting instead that their thinking is merely of the plodding sort we all could manage if we just put in enough hours. This is about as wrong as you can get, not just, obviously, in the creative arts, but in maths and science, as we will see in Part II. (It seems to me a natural expression of our curiously resentful age, so suspicious of individual differences, and in which the rhetoric is that we all have it in us to be geniuses: a clearly false assumption, though some people presumably derive comfort from it.) Of course ground work needs to be done – nobody denies that – you need to know your chosen field well, and persistence is often needed to keep going at something till you get the solution. But it would be a mistake to conclude that the creative insights, when they come, are a consequence of following rules. In a letter to a Baron B — who had

enquired about how he set about writing, and how it was that his work was so distinctive, Mozart wrote (the text may have been embellished: see note):

How do I write, and how do I come to flesh out what are large, general ideas? I really can't tell you any more than this – because I myself don't know any more about it, and can't get any further with it.

It's when I'm feeling right and things are good, perhaps riding in a coach or taking a walk after a good meal, or in the night when I can't sleep – these are the best times, when thoughts come flowing into my mind, like a stream. How they come, and where they come from, I don't know, and I can't do anything about it. The ones I like I keep in my head and go around humming them; at least that's what people tell me. If I hang onto them, I soon come to see, one by one, how to use such and such a phrase, how to make a tasty dish out of them all, using counterpoint, and respecting the timbre of the different instruments, etc, etc, etc. That fires up my soul, and as long as I am not distracted, the work grows; I expand it, and it becomes clearer, until I have the thing pretty much finished in my head, even if it's long; so that from then on I see it all in my mind's eye at a glance, much as one sees a beautiful picture or a pretty woman, and I don't hear it sequentially in my imagination, as it will have to be later on, but, as it were, all at once ... When I later come to write it down, I just take, straight out of my brain box, what's already assembled there, as I've explained. For that reason it goes down on paper pretty quickly, since, as I say, it's really already finished, and rarely turns out much different from what was in my head all along. That's why I don't mind being disturbed while writing; and I quite like all sorts of things going on around me; I carry on writing just the same; and can even chat away at the same time about hens and geese, or Jack and Jill, or whatever ... As to how it is that during the process my pieces come to take on a Mozartian form or style, one not like anybody else's, it's like asking why my nose is big and curved – it's Mozartian, and not like other people's! I don't aim for distinctiveness and I can't really describe what's different about my style. But it's obvious that people who really have something particular about them will be different from each other on the inside

as well as on the outside. All I know is that I am not the author of either kind of difference.²³²

Note here that Mozart describes all the elements that are *not* rule-following, assembly line production, and how they all have right hemisphere characteristics: he can neither see into nor control the process; there is a flow or stream (thoughts come ‘*stromweis*’); he cannot say where it comes from; it happens without him needing to write it down, and he sees it as a whole, like a picture, not serially; and it has a unique quality, which is not the result of contrivance, but is as much a part of him as his nose.

And then there is Handel, who wrote the whole of *The Messiah*, approaching four hours’ worth of some of the greatest and most inspired music ever written, in just over three weeks, between 21 August and 14 September 1741, interestingly while still recovering from his left hemisphere stroke. Of those three weeks of inspired creation, during which music seemed to pour out of him, he said: ‘Whether I was in my body or out of my body I know not. God knows it!’²³³ He also said, though, no doubt, this will afford Dietrich and his colleagues no end of merriment: ‘I did think I did see all heaven before me, and the great God himself’.²³⁴

This is not a proto-Romantic phenomenon. There are examples from many periods and cultures.²³⁵ For example, the great Elizabethan composer William Byrd wrote that

In the very sentences (as I have learned from experience) there is such hidden and concealed power that to a man thinking about divine things and turning them over attentively and earnestly in his mind, the most appropriate measures [melodies] come, I know not how, as if by their own free will, and freely offer themselves to his mind.²³⁶

So much for the assembly line theory of musical genius. I could multiply the impression by reference to countless individuals – composers, poets, scientists and mathematicians – on their own creativity. Ghiselin collected together nearly 40 of them, ranging from Wordsworth to Einstein, from Poincaré to Picasso.²³⁷ What he emphasises, and they emphasise, is the necessity of things going on at the crucial stage either wholly outside of

consciousness, or at most on the margins of conscious awareness, *not* in the centre of the attentional field. Ghiselin concluded from his survey that ‘production by a process of purely conscious calculation seems never to occur.’²³⁸ The mathematician Jacques Hadamard surveyed over 100 scientists and mathematicians and drew similar conclusions.²³⁹ Carl von Weizsäcker wrote:

A great scientific discovery is the recognition of a particularly simple and fundamental form which heretofore had been hidden in a chaos of appearances and misunderstood theories. It is often described as an inspiration or special gift of grace which comes to the researcher when and as it pleases, like an answer from “another authority” and then almost without effort on his part. It is never viewed as the inevitable result of his research effort.²⁴⁰

And I don’t know the inside story of Apollo 11, but the most serious of the many technical problems it faced was apparently this. During the landing, the lunar module’s engine thrust started to fluctuate wildly due to a programming error. The algorithm that controlled it had become only marginally stable. Then, according to engineer Bart Hennin:

a second brilliant programmer found an ingenious way to rewrite the software so there was only effectively a 0.02 second delay ... Had the clever 2nd programmer not reduced the delay from 0.03 to 0.02 seconds, the throttle would have gone from meta-stable to COMPLETELY UNSTABLE and the landing(s) would have been impossible! ²⁴¹

If you really think being a ‘brilliant’ programmer is simply following procedures, rather than to a great extent following intuition, talk to a few. This one had minutes to find an ‘ingenious’ solution, which almost certainly means it was not standard, assembly line thinking at all. Dietrich’s own description of the solutions as ‘imaginative’ suggests he knows this perfectly well.

And as to those ‘countless creative solutions generated by systematically eliminating alternative possibilities?’ Isn’t that *precisely*

what the accounts of creative people suggest hardly ever occurs – if at all? Having pointed out that there isn't enough time in the universe for the mind to process all the possibilities, and so it must be selective at a level below consciousness, the great mathematician Henri Poincaré writes:

This, too, is most mysterious. How can we explain the fact that, of the thousand products of our unconscious activity, some are invited to cross the threshold, while others remain outside? Is it mere chance that gives them this privilege? Evidently not. For instance, of all the excitements of our senses, it is only the most intense that retain our attention, unless it has been directed upon them by other causes. More commonly the privileged unconscious phenomena, those that are capable of becoming conscious, are those which, directly or indirectly, most deeply affect our sensibility.²⁴²

In a chapter in Dietrich's new book *How Creativity Happens in the Brain*, modestly entitled 'A disciplined demolition project' – a chirpy overstatement on both counts – he urges that the concept of divergent thinking is incoherent. But, he notes, with just a hint of irritation, 'even when investigators acknowledge the problem in their paper's introductory remarks, mostly because some referee in the peer-review process forced them to, they, undaunted, proceed to use the flawed construct anyway'. How maddening is that? All those psychologists, researching for decades, have been (except, of course, for Dietrich himself) chasing a will o' the wisp. It really is a shame they are so stupid:

... The issue seems simply to be a case of logic 101. If you wish to better circumscribe a phenomenon's existence, you must delineate your proposal from something, a control condition of some kind that either contains its opposite or at least is marked by its absence ... Actually, divergent thinking is only the most influential of a whole stack of such false partitions. Psychologists and neuroscientists, often with more enthusiasm than sense, have put forth a number of such forlorn proposals. Open any source on creativity, academic or otherwise, and you will find an extended list of false category formations that aligns creativity with, say, low arousal, defocussed

attention, flow states, lateral thinking, latent inhibition, remote associations, unconscious thinking, altered states of consciousness, madness, alpha power enhancement and, not forgetting, right brains, to name the popular themes. We can add each and every one of them to the list of demolition targets because common sense alone tells you that the exact opposites are also wellsprings of creative thinking and, to complete the factorial crossover, each and every one of them is associated with non-creative thinking. Such category formations flout basic logic.²⁴³

Well, there's lots of rich stuff here. Complex phenomena are likely to have complex correlates. Worthy, therefore, of something more subtle than 'a demolition job'.

Let's start with divergent thinking. I have no love of the term myself – language is inevitably poor at capturing anything subtle. One reason that psychologists go on using the term might be because it – or something very like it – is indispensable. One can't help agreeing with Dietrich, though, about it being 'a case of logic 101'. Because in logic 201, one would discover that things get a bit more complicated, and one needs a more sophisticated approach than the one being touted here. If it is hard to define something neatly, that doesn't mean it doesn't exist: it often means that the phenomenon is complex, or that, though the term one is applying is a useful placeholder for the phenomenon, the phenomenon itself can't be perfectly circumscribed by it. Thus there exist organisms such that we can't say definitively whether they are plants or animals, but I suspect most of us find the distinction useful, and can tell the difference between an elephant and a gumtree.

He complains that there are examples of divergent thinking that aren't creative, and of creative thinking that aren't divergent. The first might be true – though, as I have suggested, what is meant by divergent thinking isn't just a random splurge of ideas, but a process guided by intuition towards its goal. But I doubt there are good examples of creativity that don't involve divergent thinking, at least at key stages. Be that as it may, as a type of argument it is not terribly impressive. I say the warm climate of Southern California is due to its getting a lot of sunshine. You say that my concept of sunshine is incoherent, and that the argument 'flouts basic logic', because sometimes the sun shines and it's not hot, and sometimes it's hot when the

sun doesn't shine. I remain unpersuaded by your view that 'common sense alone tells you' that moonshine is just as good a candidate.

Most matters to do with the human psyche are like this. Take something as real and as devastatingly important as depression. It is best characterised by a constellation of symptoms: low mood, early morning waking, loss of appetite, anhedonia (loss of the capacity for pleasure), loss of motivation, poor concentration, and thoughts of worthlessness, sometimes of suicide. If you want to investigate depression, these are, without a shadow of doubt, what you need to be investigating. It's no good telling me that for each or any of these symptoms, you can show me someone who has it but is not depressed, nor – 'to complete the factorial crossover' – that you can find cases where people who are clearly depressed do not have it – even low mood.²⁴⁴ Both situations are common. Diagnosis by numbers stands to an experienced physician's judgment as painting by numbers does to a Holbein. This is something doctors frequently have to explain to fledgling lawyers, rarely to experienced judges. Back to logic 201.

In any case, one is now naturally fired up to know what Dietrich's preferred alternative is going to be. At last it is revealed: apparently something he calls 'ideational combination'.²⁴⁵

Forgive me for being able to contain my excitement. Ideational combination, or the same phenomenon by other more elegant names, has been consistently fingered for two thousand years as an important element in creativity. I earlier quoted Aristotle: 'the greatest thing by far is to be a master of metaphor [a combiner of ideas]. It is the one thing that cannot be learnt from others; it is also a sign of genius, since a good metaphor implies an intuitive perception of the *similarity in dissimilars*'.²⁴⁶ Notice, by the way, that Aristotle thinks, as I do, that combining ideas well cannot be taught, because it is not a matter of applying rules, procedures or principles, but a matter of intuition. And, while I think of it, Aristotle could have helped Dietrich get over his problem with imprecise concepts. 'It is the mark of an educated man', says Aristotle, 'to look for precision in each class of things just so far as the nature of the subject admits'.²⁴⁷ I'd have thought it was clear that the creative imagination was a reasonable candidate for the less precise approach.

Furthermore, ideational combination, or the seeing of analogies, the making of combinations of ideas hitherto thought to be unrelated, is already one important element in what is indicated by 'divergent thinking'. The

term ‘ideational combination’ is fine as far as it goes, but it only goes so far; in that respect it is no different from the (for the most part perfectly sensible) suggestions, which Dietrich economically dismisses *en masse* as ‘forlorn proposals’. None of them is the last word on creativity, of course, but none of them pretends to be; neither is Dietrich’s ‘ideational combination’. And I’m afraid it is no better at passing Dietrich’s own ‘basic logic’ test. There are, fairly obviously, an almost infinite number of ideational combinations that are completely uncreative; and some productions, widely regarded as creative, that are not (without stretching the concept to the point of meaninglessness) ideational combinations, such as Yves Klein’s nearly 200 monochrome blue paintings, the so-called IKB series. That’s where the concept of ‘divergent thinking’ has the upper hand, since that’s one thing – about the only thing – the paintings do display, apart from a very attractive shade of blue.

But how valid is Dietrich & Kanso’s claim specifically that *right hemisphere* theories of creativity are, in so many words, baloney? So far I have dealt only with broad issues flagged up by Dietrich & Kanso’s paper. But they base their conclusion ‘that creativity, or any alleged stage of it, is not particularly associated with the right brain or any part of the right brain’ on a review of a large number of papers. In order to do justice to their work I would have to examine those papers myself. So, as you would expect, I have. Since dealing with it involves a detailed rebuttal that would interrupt the flow of the chapter as a whole, I have placed it in Appendix 1, to which the interested reader is referred. I imagine Dietrich and Kanso will not welcome the conclusion I suspect the reader will draw.

Lastly let us turn to the question of the relationship between mental illness and creativity.

CREATIVITY AND MENTAL ILLNESS

‘Illness, madness and death were the dark angels who watched over my cradle and have accompanied me throughout my life’, wrote Edvard Munch. ‘Without anxiety and illness, I should have been like a ship without a rudder.’²⁴⁸

When it comes to the topic of creativity and mood disorders, or as Dietrich puts it ‘madness’, it seems that despite his antipathy to this idea (among many others), it is a fair bet that there is a good deal in it, as has been surmised for thousands of years. Dryden famously wrote: ‘Great wits are sure to madness near allied, / And thin partitions do their bounds divide.’ But some two thousand years earlier Aristotle asked: ‘Why is it that all men who have become outstanding in philosophy, statesmanship, poetry or the arts are melancholic?’²⁴⁹ It would have been an odd observation to make if such people were no different from any others, especially since Aristotle was an exceptionally good observer of human behaviour. But it is no more than one might expect if creativity is right hemisphere-dependent, since there is a clear connexion between the right hemisphere and melancholy or sadness. Indeed creativity, sadness, non-verbal thinking, empathy, intelligence and a preponderance of right hemisphere activity are all multiply interconnected.

I have given an account elsewhere of the very extensive evidence from a wide range of sources, including a large number of lesion studies, as well as EEG, fMRI and visual field studies, for a connexion between the right frontal pole and sadness or depression, and between the left frontal pole and euphoria or mania, so I will not repeat it here.²⁵⁰ The lifetime risk of major depression is linked to relatively less left frontal activity for both sexes.²⁵¹ And such tendencies affect our everyday experience; to take just one example, those with greater levels of right frontal activity rate music sadder than those with greater left frontal activity.²⁵²

We know that greater right than left parietal activation at rest predicts a better performance on visuo-spatial reasoning, and greater left than right parietal activation at rest a better performance on verbal reasoning tasks.²⁵³ In keeping with this, we also know that the ability to generate visual designs quickly and fluently is strongly associated with the right frontal

lobe, whereas verbal fluency is strongly associated with the left frontal lobe.²⁵⁴ It is striking that experimentally inducing negative affect seems not only to increase activity in the right frontal pole, but the capacity to think visuo-spatially; and inducing positive affect leads to both left frontal activation and increased verbal fluency. The cognitive changes accompany, and appear to be secondary to, the emotional changes.²⁵⁵ This picture is in keeping with the obvious differences between manic states, in which individuals are euphoric, words (whether meaningful or not) tumbling forth like a lava stream, and depressive states in which language seems to desert its victims, who become monosyllabic or mute. Melancholy has been associated with wisdom, scholarship and solitariness:²⁵⁶ but also with silence. Cesare Ripa's Melancholicus shows him thinking, but not speaking: he is reading a book and his mouth is gagged. ²⁵⁷



Fig. 24. 'Melancholicus' (detail) (from the Iconologia of Cesare Ripa, originally 1593, first illustrated 1603: here from the engravings by Gottfried Eichler for the Hertel edition of 1758-60: Part V, 109)

Since we have noted that thinking in images, models and analogies is a prerequisite of creativity, while thinking in words is not (and may actually inhibit creativity at the truly generative stage, rather than at the later more consciously critical stage), it might be expected that mood changes that promote the right frontal cortex will be associated with creativity in a way that those engaging primarily the left frontal cortex will not.

What is the evidence for a connexion between creativity and mental illness? The full story may be complex, but one thing is sure: that it has been debunked is another of the myths that needs debunking. Some people believe there is nothing in it, certainly, but others have good grounds for being equally sure that the idea is importantly revealing.

Before we go any further, please note that it is not a telling observation that some creative people show no signs of mental illness whatever, while others are mentally ill without being creative. I say this because it is solemnly repeated in the literature as though it had some logical force in relation to the point at issue, which is whether mental illness is over-represented amongst creative people. At the risk of stating the obvious, for there to be a highly significant relationship it does not have to be obligatory in either direction. This prejudice against broadly true generalisations, on the basis that we can all think of examples that don't conform, is one of the prevalent fallacies of our age. All knowledge is uncertain, but not *therefore* invalid.

The other prevalent fallacy also arises from the fear of uncertainty, and also applies here. According to this fallacy, the fact that problems of definition make a phenomenon hard to deal with neatly and precisely demonstrates that therefore any intuitively likely conclusion, accepted in some cases for centuries, is *mistaken*. Of course it shows no such thing. All it shows is that the intuitively likely conclusion cannot easily be proved. But neither can many – perhaps all – of our beliefs regarding the most important human concerns. All approaches are open to challenge, but it would be mindless to dismiss all approaches to important questions on that basis. It smacks of the narrow-mindedness of the left hemisphere. On this basis no-one would ever be allowed to have fallen in love. You can imagine the fuss. What does it mean exactly to 'fall in love' – what counts and what doesn't? Should we rely on self-report, with all the attendant problems, or should we not measure something? If so, what? How many subjects should we study? Who would count as control subjects? Whose judgment do we trust? Presumably no-one's? So, we gravely conclude, the concept is meaningless, and the phenomenon an illusion. The left hemisphere simply ignores, dismisses, and ultimately denies the existence of, anything it can't pin down and measure.

Turning to the point at issue, whether there is a relationship between creativity and mental illness, one approach to the question has been to

assess prominent creative individuals historically, an approach that is clearly dependent on the quality of the information available, but not a hopeless situation for all that. Such studies depend on personal judgment, but while we should undoubtedly strive for the most reliable methods, how superior, actually, are the supposedly objective alternatives we have developed at identifying what we are interested in? In any case, on this basis Cesare Lombroso, Francis Galton and Wilhelm Lange-Eichbaum among others, all explored and confirmed the apparent excess prevalence of mental abnormalities, particularly affective disorders, amongst ‘geniuses’.²⁵⁸ Havelock Ellis, one of the first to try a comparatively objective method, namely selecting the 1,030 people whose entries in the *Dictionary of National Biography* rendered them eligible for study, did not find any elevated rate of mental disorder, but, as has often been pointed out, few of the worthies included in his study were geniuses by any stretch of the imagination.²⁵⁹

In our own time the psychiatrist Felix Post studied 291 eminent scientists and inventors, thinkers and scholars, statesmen and national leaders, painters, sculptors, composers, novelists and playwrights for whom adequate biographical information was available, and found the artists and writers to have high rates of affective disorders and alcoholism.²⁶⁰ Psychoses were not especially common, and, where evident, were entirely restricted to affective disorders (depression and bipolar disorder), not schizophrenia. He concluded that, unlike schizophrenia, ‘depression and alcoholism are causally linked to some kinds of valuable creativity’. It is a common experience, confirmed by research, that alcohol can enhance insight-solving, but not analytic-solving.²⁶¹ Reliance on alcohol is, of course, also a common accompaniment of affective disorders, sometimes thought of as ‘self-medication’ for anxiety and low mood.

Another retrospective review of creative artists found ‘a much higher rate of mood disorders in artistic populations than could be expected from chance alone’.²⁶² A review of composers over three centuries reached similar conclusions.²⁶³ A book-length, in-depth review of 195 historical writers, artists, and composers by Kay Redfield Jamison reached the conclusion that depression, cyclothymia (which could be considered an attenuated form of bipolar disorder) and bipolar disorder were unusually common (about 8–10 times commoner) in such individuals.²⁶⁴ Looked at

the other way round, rates of creativity are abnormally high in individuals with affective disorders and their relatives.²⁶⁵

Another approach is to study closely a group of living subjects. A combined historical and contemporaneous analysis suggested that affective disorders were prominent amongst writers and artists, especially bipolar disorder.²⁶⁶ Nancy Andreasen has repeatedly studied The Iowa Writers' Workshop (a famous graduate-level creative writing programme in the United States with many celebrated poets and writers among its alumni); her final study consisted of 30 subjects and 30 controls.²⁶⁷ Rates of mood disorder 'were extremely high in the writers'. She found that 80% (compared with 30% in the control group) had some type of mood disorder, 37% (compared with 17%) had major depressive disorder, 43% (compared with 10%) had bipolar disorder, and 30% (compared with 7%) suffered from alcoholism.²⁶⁸ It is somewhat ironic that Andreasen's research is now stigmatised for relying on painstaking hours of interviewing subjects, and the subsequent application of research criteria – probably the method that provides the highest levels of sensitivity and specificity, although inevitably she was not blind to subject identity. In a study of 47 contemporary subjects, selected for having received a prestigious creativity award, Jamison compared novelists, poets, playwrights, artists and biographers, and, in an attempt to obviate personal judgment, used the criterion of having received treatment for a mood disorder.²⁶⁹ The rate of treatment for affective illness was 'strikingly high' (38%) given that the lifetime prevalence for bipolar and unipolar disorders in the general population are 1% and 5% respectively.²⁷⁰ Poets had the highest rate of requiring medical treatment for mood disorder (50%); they were also the only group to have received treatment for mania (a relatively small subset of the sample). Given that many episodes of mood disorder never reach medical attention, and more antidepressants are prescribed to females than males, while the sample of writers was largely male, the results are, as Jamison points out, still more striking. Biographers, by contrast, 'who provided a comparison group by being outstanding but perhaps less creative writers', reported no history of mood swings or elated states, and a lower rate (20%) of medical treatment for depression.²⁷¹

James Kaufman, in a study of 1,629 writers, found that poets, particularly female poets, were particularly likely to suffer from mental

disorders.²⁷² In a follow-up study examining 826 Eastern European writers of all kinds over 1600 years he again found that poets had higher rates of mental disorders than other types of writer.²⁷³ A study by Arnold Ludwig of over 1,000 eminent people found bipolar disorder, schizophreniform psychosis and depression to be over-represented in the creative arts group.²⁷⁴ A later study by the same author of 59 living female writers compared with 59 matched controls found high levels of depression, anxiety and substance abuse in the creative group.²⁷⁵ Other reviews of living artists of various kinds support this conclusion.²⁷⁶ One study of over a million people carried out at Sweden's prestigious Karolinska Institute found a significant correlation between those in creative professions and mental illness (in particular depression, anxiety, bipolar disorder, schizophrenia, and substance abuse), and demonstrated an increased likelihood of death by suicide.²⁷⁷

Suicide is a relatively rare event, accounting for about 1 in 10,000 deaths in contemporary Britain, slightly more in the US.²⁷⁸ If you have an impression that creative artists are more likely than average to kill themselves, you might be right. There is, of course, nothing scientific about Wikipedia, but it has the advantage of being a fairly representative compendium of figures that have achieved a degree of distinction across a very wide range of activities and professions. It might be indicative that it lists 158 poets, 69 painters and sculptors, and 55 composers who are known to have killed themselves (it has a separate category for unconfirmed but suspected suicides). This compares with 19 academics and eight critics.²⁷⁹ For 158 suicides in poets to be expected, there would have to be Wikipedia entries for about 1,580,000 poets. As far as I can tell there are 2,386.

One might ask how it is that poets, whose chosen medium is language, are so highly represented among those who suffer from depression. Does that not undermine my association of creativity, depression and the *right* frontal cortex? I do not believe so. Poetry is precisely the use of language to transcend the ordinary limitations of language: it relies heavily on metaphor as opposed to literal statement, on implicit connotative meaning as opposed to explicit denotative meaning, on the musical aspects of language and on an empathic ability to enter into the mind of another, all of which skills are ultimately dependent mainly on the right hemisphere, and may even require relative effacement of the fluent left frontal cortex. It is also about

uncommon insight into the nature of reality, into the depth of human feeling and experience – all better achieved by the right hemisphere than the left, as we shall see in due course; and against all of which the cheerful optimism of the left hemisphere is a terrific anaesthetic. Boswell reports, in his *Life of Johnson*, an old schoolmate of Johnson's, one Oliver Edwards, saying, 'You are a philosopher, Dr Johnson. I have tried too in my time to be a philosopher; but, I don't know how, cheerfulness was always breaking in'.²⁸⁰ No impediment, actually, to a philosopher of the modern Western academic variety, but an impediment no doubt to what Edwards had in mind by one – someone closer to a poet than a pedant. The only scanning study of which I am aware to date comparing the reading of poetry with reading of prose reveals that regions of the right hemisphere are engaged by poetry that are not engaged by prose, in particular the right temporal pole and posterior cingulate cortex, and that 'the emotional charge of literary texts is mediated by similar brain structures to the emotional charge of music, particularly involving the right hemisphere.'²⁸¹ The same right temporofrontal regions participate in both musical rhythm and verse metre processing.²⁸²

Incidentally, it is also a common observation – which means, naturally, that while quite probably right, it will prove a test of ingenuity for some kinds of psychologist to 'prove' it wrong – that there is a high rate of mental illness in comedians. A roll call of contemporary comedians known to have suffered from depression includes Woody Allen, Lenny Bruce, Graham Chapman, John Cleese, Peter Cook, Tommy Cooper, Tony Hancock, Kenneth Williams, Spike Milligan, Dudley Moore, Richard Pryor, Victoria Wood, Robin Williams, Stephen Fry, Ruby Wax, Jack Dee, Caroline Aherne, David Walliams, Mark Watson, Graham Fellows, Peter Sellers, Sarah Silverman – and many others. An investigation of 523 individual comedians contrasted with actors concluded that, like other creative individuals, they commonly displayed 'the personality equivalent of bipolar disorder, corresponding to what in an older personality literature would have been termed "cyclothymic temperament"'.²⁸³ We have already seen that sense of humour is highly dependent on right frontal function, to the extent that those with lesions in this area cannot understand jokes or humorous cartoons; and that comedians' creative use of connotative and ambiguous language, and reliance on only partially stated meaning, have many overlaps with poetry.

But, it might still be asked, how is it that depression could in *any* form be associated with creativity – depression that is usually marked by complete lack of fluency and motivation? This is a pertinent question. Resolving that paradox depends on being clear about both the timing and the degree of the affective disorder. For in fact very few poets have been particularly creative when in the throes of mania, with its *excess* of fluency and motivation, any more than in the throes of depression. It may be that having the disorder promotes creativity, though its more extreme expressions inhibit it while they prevail. A study of 24 manic-depressive artists found that, while a quarter reported being more creative untreated with lithium, half reported being more creative when treated with lithium; a quarter found there was little difference.²⁸⁴ Andreasen also suggests that treating bipolar disorder is likely to improve, rather than impair, creativity.²⁸⁵

Similarly, in the depths of despair the muse is likely to desert the creative artist, but the recovery period may be highly fruitful. ‘Among the writers in the Iowa Workshop study’, Andreasen reports, ‘essentially all of them reported that they were unable to work creatively during periods of depression or mania’.²⁸⁶ It is the later period, during remission, that brings the creativity: ‘For some composers it seems that they are most productive immediately after a phase of depression’, as one study of depression in the lives of 12 composers concludes.²⁸⁷

The economist and statistician Karol Jan Borowiecki used linguistic analysis software to scan the text of 1,400 letters written by Mozart, Beethoven and Liszt to their friends, colleagues and loved ones, and analysed the results for the expression of positive and negative emotions, such as joy, love, grief and heartache.²⁸⁸ He then plotted the course of mood against creative production. The resulting curves are striking: he found a consistent link between the intensity of negative emotions, especially sadness, and subsequent periods of artistic brilliance. He concluded that such sadness was not just correlated with creativity but that it actually had a reliable causal effect, typically delayed by some months.

It is frequently noted that some mental illnesses, such as schizophrenia, are widely distributed and conserved in the world population despite being associated with a high degree of morbidity and vulnerability, reduced life expectancy, and low levels of mating and fertility. This apparently anti-Darwinian trend suggests that, while those who have enough of the genes

involved to bring about the full diagnosable disorder may be at a disadvantage, their relatives, who may share only some of the genes, are at an advantage.²⁸⁹ There is a body of literature that suggests precisely that.

As we have seen, in his study Post found that the mental conditions associated with creativity were by no means principally psychotic and, when they were, were confined exclusively to affective psychoses rather than schizophrenia. Having schizophrenia tends to impede creativity, unlike having an affective disorder. But having some, but not all, the genes for schizophrenia may promote creativity. There are a number of what could be seen as *formes frustes* of the condition, lying somewhere along the schizo-autistic spectrum, but falling short of full-blown psychosis, which seem to be common amongst creative people, in science and mathematics as much as, or more than, in the arts. I would agree that there is, as one paper puts it, ‘overwhelming support for a positive relationship between creativity and schizotypy’, a personality type which shares some features, but importantly not all, with schizophrenia.²⁹⁰ And we saw earlier that schizotypy (unlike schizophrenia) tends to increase some kinds of right hemisphere activity. It has been repeatedly shown that the *healthy relatives* of people with psychotic illnesses such as schizophrenia and bipolar disorder, and who presumably share some traits, are more creative than average.²⁹¹ A study of bipolar subjects, cyclothymes, their well first-degree relatives and controls found that being cyclothymic or a close relative of a subject with bipolar disorder was associated with greater creativity than being severely ill or having no genetic relationship to individuals with bipolar disorder.²⁹² Individuals with bipolar disorder and healthy siblings of people with schizophrenia or bipolar disorder were over-represented in creative professions, according to a study of 300,000 subjects.²⁹³ Indeed a study of artistic creativity, defined very loosely as tertiary education in ‘an artistic field’, uncovered higher rates of hospital admission for each of schizophrenia, bipolar disorder and depression; but the criterion seems to me too loose to be of much value.²⁹⁴ At the genetic level, an Icelandic study of 88,000 subjects found that people in creative professions are significantly more likely to have gene variants that increase the risk of bipolar disorder and schizophrenia.²⁹⁵

Another question that arises is whether induced mood states in ‘normal’ subjects modify cognition in the same way that the mood states of those

with mental illness (or a partial or mild form of mental illness) seem able to do. Right greater than left frontal activation seems to occur during temporarily induced negative emotional states as well as more chronic low moods,²⁹⁶ and to occur whether or not the individual has a diagnosis of a mood disorder.²⁹⁷ Does that have an effect on creativity? It has been found that such induced negative mood can result in improved performance on creative tasks, particularly those requiring concentration, divergent thinking, and analogical problem-solving.²⁹⁸ But the results are not clear-cut or reliable. For example, some right hemisphere cognitive functions appear to deteriorate in depression: one possibility would be that ‘the frontal activity in the right hemisphere represents some sort of inhibitory function that has the effect of suppressing the information processing operations of the right hemisphere during depressive emotion’.²⁹⁹ One of the few research efforts that specifically addressed the need or otherwise for a pre-existing vulnerability found that being subjected to social rejection increased creativity, but did so to the greatest extent in those who were ‘biologically vulnerable to experiencing negative affect’, suggesting that the effects are, perhaps unsurprisingly, a combination of circumstances with pre-existing genetic vulnerability.³⁰⁰

There is, however, another puzzle involved. There is much evidence that negative emotions can lead to creativity, probably by a range of routes: for example, by enhancing contact with a more emotionally rich level of awareness, more broadly ramifying into redolent emotional memory, and involving deep unconscious and embodied cognition, as well as analogical thinking; or by inducing self-reflective thought; or perhaps by encouraging perseverance.³⁰¹ But the picture is highly variable. Some studies have suggested that happiness, rather than sadness, is more creative,³⁰² while other studies report mood as making no difference.³⁰³ How is that?

The answer may be that we are not comparing like with like. It may make a difference what stage of the creative process we are talking about (positive mood may be a help when dealing with what I have called the later, ‘translational’, phase, but not in earlier phases). It may also make a difference whether we are talking about individuals working alone or in groups: for example, one of the studies that showed positive mood to be more effective was a study of groups not individuals, in which positive mood had an energising effect, as one might expect;³⁰⁴ and another found –

surprise, surprise – that inducing a good mood led to the subjects enjoying their task more.³⁰⁵ Furthermore, not all so-called negative (in reality often valuable) moods or positive (in reality often negligible) moods are alike. In creativity tests, where mood was induced by showing film clips, amusement, on the positive side, broadened attentional focus, while appetite narrowed it; on the negative side, sadness broadened it, while disgust narrowed it. ³⁰⁶ Amusement and sadness were associated with greater creativity than appetite and disgust. Sadness is more right hemisphere-related, disgust more left hemisphere-related.³⁰⁷

Mind you, one of the many artificialities of such studies is that they imagine that human beings experience largely simple emotions, rather than complex ones fraught with ambivalence. Such ambivalent emotions may be more important in creativity, another possible reason for conflicting results in the literature assessing emotional ‘valency’.³⁰⁸

It may also make a difference what type of creative work we are considering. A study of Goethe’s moods in relation to creativity found that poetic inspiration and insight came to him when he was psychologically labile, even clinically depressed, while

Goethe’s scientific and social activities and achievements were associated with personal well-being, but also with lack of poetic inspiration ... Goethe’s depressive moods were associated with eminent poetic creativity whereas in times of scientific and political productivity Goethe seemed to be protected against depressive episodes.³⁰⁹

But, most importantly, it may make all the difference whether we are talking about creativity with a ‘little c’ or with a ‘big C’. Paradoxical though it may seem, our desire for objectivity may make it harder for us to reach the truth, since, if the phenomenon itself is both rare and (when it exists) hard to study, it may be tempting to study something that looks like it, but is commoner, and easier to pin down. The only problem with this is that you are now studying something completely different. There may be all the difference in the world between run of the mill ‘creativity’ and that of the genius.

Dean Keith Simonton has written about and researched geniuses for many years. He argues that there is a distinction to be made between ‘everyday’ creative people, identified as such perhaps because they work in a science research department or as a photographer, and the once or twice in a generation, highly creative, geniuses. While everyday creativity probably leads to improved satisfaction, self-esteem and enjoyment of life, really pushing the boundaries may come at a price. He calls this the ‘mad-genius paradox’.³¹⁰ There is a potential parallel here with a finding we have already seen. Nine of the studies cited by Dietrich & Kanso showed something fascinating that their dismissive overview failed to spot: that ‘averagely creative’ individuals tended to engage primarily the left hemisphere in a creative task, whereas highly creative individuals tended to engage the right (see Appendix 1). They took this to be a ‘null’ result, but it is the opposite. This would also cohere with the finding reported by mathematicians such as Anna Sfard or Vadim Krutetsky that children averagely skilled in mathematics use serial (left hemisphere style) procedures to reach their results, whereas gifted children use analogical (right hemisphere style) thinking; as well as with the findings that those of the highest (verbal, as well as spatial) ability rely more on their right hemisphere.³¹¹

On this topic of making sure that you are really looking at the highly creative subjects, a study showed that ‘normal scientists’, those that are concerned with preserving the paradigm, and ‘revolutionary scientists’ whose work transcends the paradigm, have quite different profiles. While the paradigm-preserving, ‘normal’, scientists had lower than average levels of mental illness, the paradigm-rejecting, ‘revolutionary’ scientists had higher than average levels – in this respect resembling poets and artists.³¹²

As we have seen, there is a relationship between intelligence and creativity, particularly at higher levels. There is also a relationship between the right hemisphere and intelligence, which was explored in a previous chapter. But is there a relationship between intelligence and mood disorders?

A study of every school leaver in Sweden over a 10-year period found that excellence in academic achievement at school was associated with later development of bipolar disorder,³¹³ as did a British prospective study with over 15,000 participants.³¹⁴ A study of one million men found that men with the highest intelligence had higher rates of bipolar disorder.³¹⁵ Another

study of over 50,000 male subjects, however, found no relationship between higher intelligence and mental illness of any kind.³¹⁶ Catherine Weismann-Arcache, who studies gifted children, argues for the relationship between high intellectual potential and depression, using both historical and contemporary evidence. She and her colleagues found that, according to DSM-IV-TR criteria,³¹⁷ major depressive disorder was found in 65% of the 100 children with very high intellectual potential that she studied, a rate 10–20 times higher than would be expected for their age.³¹⁸ However, a thorough and thoughtful survey of the area by Maureen Neihart concludes that, while there are some correlations between adult psychological disorders and high IQ and creativeness, the literature on depression does not support a correlation between high IQ and depression among children and adolescents *per se*. She does conclude, however, that there is ‘clear evidence’ that creatively gifted adults, writers in particular, commit suicide at rates higher than the general population.³¹⁹

There are probably several factors involved. James Webb at the Davidson Institute for Talent Development suggests that exceptionally gifted young people are more prone to existential depression, in brief because they have greater insight, and question things that many people take for granted.³²⁰ They may feel they don’t fit in as well as other children, may subject themselves to greater pressure to succeed, and may have higher ideals. On the other hand, they may be better able to adapt, because of their insight, and may find greater fulfilment in the use of their talents. This would fit with the finding that higher IQ means a higher risk of a lifetime diagnosis of depression, but also a better level of mental health at age 50.³²¹ The obvious truth that depression can, especially during an acute episode, impair cognition and lower scores on IQ might mask a positive association between depression and intelligence.³²² And, finally, it may matter what you mean by ‘high’. One interpretation that would fit with the data is that low IQ may be associated with depression, while ‘averagely high’ IQ (around 120) may be protective against depression, and ‘super high’ IQ (over 150) may be once more associated with depression.³²³

SUMMARY

Creativity involves a number of elements in which the right hemisphere is superior to the left: breadth of vision, the capacity to forge distant links, flexibility rather than rigidity, a willingness to respond to a changed, or changing, context, a tolerance of ambiguity, and an ability to work with knowledge that is, for the most part, inherently both imprecise and implicit. It involves analogical thinking and visualisation; it is often expressed in music, metaphorical and original language, and visuo-spatial imagery, all of which are also better served by the right hemisphere than the left. It can easily be inhibited by too close following of rules, too familiar patterns of thought, a requirement for certainty and clarity, and a concern for detail too early in the process, all of which tend to be favoured by the left hemisphere. Thus, though the left hemisphere has a role to play during the later implementation of a creative insight – what I call the translational phase – it tends to impede during the generational and permissive phases, which correspond to what most people mean by creativity. There seems to be a marked increase in reliance on the right hemisphere among the highly creative, compared with the averagely creative, and not observing this distinction in experimental design has sometimes muddied the waters of research into hemispheric differences. Nonetheless, there is a very large body of evidence suggesting that the right hemisphere plays the key role in creativity.

WHAT SCHIZOPHRENIA AND AUTISM CAN TELL US

Metaphysicians do not readily descend from the heights whereon they love to dwell ... It goes against them to come into touch with minute facts, especially with such facts as mental maladies for example: they would be afraid of making their hands dirty.

—*Henri Bergson*¹

AN IMPORTANT PART OF THE THESIS BOTH OF THIS BOOK AND ITS predecessor is that we have come to see and inhabit the world in a most peculiar way: one whereby what can be offered by the right hemisphere, the one that sees and understands most, has come to be neglected, with consequences that are far-reaching – indeed devastating. In the previous chapters of Part I we have looked at aspects of hemisphere difference, facet by facet, often by examining cases in which there is literal brain damage. Since hemisphere imbalance changes what we find in the world, and since the rest of this book is about how we can arrive at some degree of truth towards and about the world delivered by the bipartite brain, it would be invaluable to get an idea of what the world actually feels like overall for a person with such an imbalance – how it actually *is* for them; to get the ‘inside’ story. We might recognise tendencies, if nothing more, in our culture and in ourselves, and thereby be on guard when we find this is how the world is coming into being for us, too.

‘Illness is philosophically revealing and can be used to explore human experience’, writes the philosopher Havi Carel:

I suggest that illness is a *limit case* of embodied experience. By pushing embodied experience to its limit, illness sheds light on normal experience, revealing its ordinary and therefore overlooked structure. Illness produces a *distancing* effect, which allows us to observe normal human behaviour and cognition via their pathological counterpart. I suggest that these characteristics warrant illness a philosophical role that has not been articulated.²

Except perhaps by William James, who as in everything was so much before his time. ‘Insane conditions have this advantage’, he wrote,

that they isolate special factors of the mental life, and enable us to inspect them unmasked by their more usual surroundings. They play the part in mental anatomy which the scalpel and the microscope play in the anatomy of the body.³

Mental illnesses and brain diseases are sometimes discussed as though they were like mechanical faults. But they are not. It’s not that the mind ‘doesn’t work’ properly, as if a component has ceased to function. In the first place, when something is altered in the brain or the mind, it is never just a component, inert and isolated. Brains and minds are living, constantly adapting, interconnected systems. And they are conscious. A brain disease or mental illness, then, is a change in a *person’s* whole way of being in the world.⁴

The phrase ‘way of being in the world’ may seem a bit mannered, but I can’t think of a good substitute. It isn’t just about thinking differently, or feeling differently, or behaving differently, though each of those is an important part (and each is bound up with the others). It involves a difference in the type of *attention* paid to the world. It is about having a whole different take on the world, a different disposition towards the world, in which certain features stand forward and others inevitably recede. In that disposition, one’s perceptions, thoughts, emotions and responses are all bound up together in a way that makes sense as a whole – even if, for some individuals, the way in which they make sense is by supporting the view that nothing makes sense at all.⁵ Diseases of the brain and mind, though disruptive and distressing for the individuals who have to suffer them, offer

us rare insights into human experience as a whole, for which we should be grateful. They throw into relief our normal reality by showing us how it could be altered and appear quite differently to us.

So how are we to get an insight into such a way of being? For this we would need personal accounts. As the reader will have seen, one of the common features of right hemisphere damage is that the individual denies that there is a problem: thus there are relatively few accounts from the inside. Accounts are usually *of* the patients, not by the patients themselves. Moreover, neurologists and neurosurgeons are mainly not concerned with alterations in phenomenology, so tend not to ask the questions that a psychiatrist might ask, and their patients are not likely to volunteer the information unbidden.

Not all subjects with altered brain function, however, fit this picture. Schizophrenic subjects, for example, often, similarly, deny that they are ill, but they are somewhat less likely to deny their experiences (though they may), and can at times be notably articulate about them: added to which psychiatrists spend a lot of time talking to them and often write conversations down. That in itself would, of course, be of little relevance here, were it not for the quite remarkable parallels between schizophrenia and right hemisphere deficit states, as I shall shortly demonstrate. There are undoubtedly different qualities to the experience of schizophrenia and that of right hemisphere damage, and there is no simple equation to be made between the two (each of which having, in any case, a variety of manifestations). Nonetheless, it is striking how each and every aspect of the *breakdown of reality* in schizophrenia that we will now be dealing with is paralleled by what in a non-schizophrenic individual would indicate a recognised typically right hemisphere, not left hemisphere, deficit.

While schizophrenia and autism are distinct conditions, they have many overlapping features, as well as sharing a genetic basis.⁶ And in what follows I will show that autism, too, in its most characteristic form, simulates many right hemisphere deficits.⁷ Disturbances of language are also, obviously, part of the phenomenology of schizophrenia, and autism, and they would normally follow left hemisphere deficits, so both hemispheres are affected; but I am concerned here with the breakdown of *reality*, which language exists to help represent, not with language in itself.

In the first part of this chapter, then, I will explain why these conditions can be assumed to give us a pretty good general idea of what it is like to

inhabit a left hemisphere-dominated world. And then I want to take a closer look at some of the particular aspects of the experienced world that come to be altered from the accounts of patients themselves.

I must stress that the reader should as far as possible abandon the standpoint of seeing these as merely pathological ‘distortions of reality’, even though they are also that (and that is how, as a physician, I would treat such an account in diagnosing schizophrenia). Rather, the reader should strive to see it instead as an authentic account of a real aspect of the world *as it comes into being* for someone largely dependent on the left hemisphere. Since all that any of us has to go on is our experience, this is how the world actually *is* for someone when the various alterations in attention, perception, judgment and so forth which we have discussed come together. Since the subject cannot know what he or she doesn’t know, it is fruitless arguing with a deluded patient: their reality demonstrably does not coincide with the best-evidenced view that we can take, and so we are quite right to think them mistaken, but for them their experience is authentic, and more compelling, than any argument. And what the subject with schizophrenia, particularly, experiences is a very alarming world. It is a take on the world that we can all approximate, in the absence of schizophrenia, if we become sufficiently dependent on the left hemisphere alone.

I suspect the reader may well conclude that there are similarities with the world we *are* bringing into being around us. Three functions that are to a very large degree right hemisphere-dependent, as the reader will know, are sustained attention, the ability to read faces, and empathy. All three are impaired in schizophrenia and in autism.⁸ And impairments in all three are increasingly being found in the younger ‘normal’ population today. But the parallels are far more numerous than such a snapshot might suggest.



Is it conceivable that elements of the way of being in the world embedded in a culture might start to resemble one hitherto largely confined to the mentally ill? This is, in fact, the argument of one of the most fascinating, and compelling, books I have ever read, *Madness and Modernism: Insanity in the Light of Modern Art, Literature and Thought* by Louis Sass, Distinguished Professor of Psychology at Rutgers. Published in 1992, and

by now a classic, the book has a riveting thesis. Sass had noticed that every phenomenon described by people with schizophrenia bore a close resemblance to phenomena not just found in, but at the core of, modernism; and in the book he illustrates his thesis in detail, across numerous domains, drawing with subtlety on a deep familiarity with the literatures of psychology, philosophy and the arts. Moreover, as he demonstrates, a surprisingly large number of people who rose to prominence in the worlds of literature, art, music and philosophy during this period (but not nearly so commonly in other periods) were on the schizo-autistic spectrum. The closeness of the parallels he draws, across so many instances, makes the similarity difficult, if not impossible, to deny. The question is, why should this be? Clearly a whole culture cannot develop schizophrenia.

The answer might lie in an observation Sass alludes to, based on findings then just starting to emerge from the neuroscientific literature, that the phenomena of schizophrenia resemble those described by subjects with right hemisphere damage (coupled with those that would result from a perhaps compensatory overdrive of the left hemisphere).⁹ Might it be, then, that as a culture we were exemplifying not, of course, a sudden epidemic of schizophrenia, but too heavy a reliance on the world as delivered to us by the left hemisphere, meanwhile dismissing what it is that the right hemisphere knows and could help us understand?

SCHIZOPHRENIA AND RIGHT HEMISPHERE DEFICIT SYNDROMES: PHENOMENOLOGY

The confluence of phenomenology between right hemisphere-damaged and schizophrenic patients, both how they perceive the world and come across to others, is extraordinary.¹⁰ We have seen that every kind of visual distortion and hallucination found in schizophrenia is also found in right hemisphere dysfunction, along with auditory, tactile and olfactory hallucinations. As far as delusions go, not merely paranoia, but monothematic delusions such as Capgras and Cotard syndromes are found not just in right hemisphere disease but in schizophrenia.¹¹ Schizophrenic patients are sometimes hard to tell from right brain-damaged subjects. For example, they were ‘statistically identical to patients with right brain damage and robustly different from those with left brain damage’ when compared on a test of social and emotional interpretation and expression.¹² Schizophrenic patients are almost indistinguishable from right hemisphere-damaged patients in failing to deal with the connotative or metaphorical, rather than the denotative and literal.¹³ A patient who had had his right hemisphere surgically removed was asked to draw a human being: an expert blind to diagnosis commented that many features of the drawing ‘strongly suggest schizophrenia’. ¹⁴

Subjects with right hemisphere damage and subjects with schizophrenia share many common characteristics. Right hemisphere-damaged subjects demonstrate impairments in the sense of the unity and integrity of the body; fragmentation of bodily awareness is associated with right hemisphere, especially right frontal, dysfunction.¹⁵ They have impairments in perceiving and recognising bodies and bodily movements – indeed biological motion of any kind;¹⁶ and can exhibit a startling inability to recognise their own face, parts of their own bodies or their body as a whole.¹⁷ All of these are well-described phenomena in schizophrenia (and in some cases in autism; see notes).¹⁸ But, while these, along with delusions and hallucinations, are some of the more dramatic and well-known features of schizophrenia, at the core of the condition lies a host of much subtler changes that are in a way

more troublesome, and these are also highly characteristic of people with right, but not left, hemisphere damage.¹⁹

Both those with right hemisphere deficits and those with schizophrenia tend, for example, to exhibit emotional indifference, passivity and lack of initiative.²⁰ Both show diminished expressivity in, and receptivity to, facial expressions, vocal prosody (expressive and receptive understanding of intonation) and bodily gestures.²¹ Both groups tend to neglect context, and therefore have difficulty appreciating the ‘discourse elements’ of communication. Both find narrative difficult to understand,²² and difficult to generate.²³ Both complain of being unable to read a book or watch a film, because they cannot integrate the storyline over time.²⁴

Both tend to confabulate.²⁵ Both have deficits in pragmatics, the overall understanding of the meaning of an utterance in context. They have similar problems in dealing with the implicit – not just tone of voice, but tone of any kind, including humour, irony or sarcasm;²⁶ facial expressions and body language; and other implicit processes such as understanding metaphor.²⁷ They rely on the explicit and literal. Both are relatively limited in the expression and interpretation of emotion. Both have difficulty being flexible in their views or patterns of behaviour; both can encounter problems in understanding another’s point of view, and in ‘theory of mind’, the capacity to see that what another person knows may be different from what you know.²⁸

They have similar problems with *Gestalt* perception – seeing the whole; and similar attentional deficits, particularly in sustaining attention over time.²⁹ A cardinal feature of schizophrenia is the inability to sustain the all-important sense of the whole. ‘The most plausible psychological theory of [schizophrenia’s] nature is a breakdown in *Gestalt* and the most plausible biological theory involves some degree of hemispheric imbalance’, argue John Cutting and Francis Dunne.³⁰ Schizophrenic subjects have a reduced capacity to see the whole pattern;³¹ they respond faster to local targets;³² and tend to adopt a ‘piecemeal’ approach in the description of complex images.³³ Out of 60 reviews of this area in the literature to 2010, 55 found that dysfunctional perceptual organisation, particularly deficits in appreciating the broader picture and contextual information, were highly characteristic of schizophrenia and probably underlie other aspects of the condition; as well as constituting in themselves a serious handicap, which

on its own predicts poorer long-term outcome.³⁴ As the review authors point out, in such subjects there is a ‘widespread deficit in the generation of contextually co-ordinated neural activity across both space and time’.³⁵ Full appreciation of space and time is highly dependent on the right hemisphere as we have seen, and will see further in Chapters 22–4, and both tend to be widely aberrant in right hemisphere dysfunction.

Perception is not a mosaic of independent responses to local stimuli, but involves constant interactions, back and forth, between local stimuli and the context, as well as one another; understanding the resultant wholes is what makes sense of the world.³⁶ In schizophrenia, the object in itself tends to become isolated, focussed on at the expense of the context.³⁷ When a perceptual task can be carried out piecemeal and solely from the bottom up, schizophrenic subjects and those with schizophrenia spectrum disorders perform relatively normally.³⁸ Their perception is impaired in proportion to the degree to which the experimental task requires one to go back and forth between the local level and that of the whole that is *itself in the process of coming into being*.³⁹ One theory is, indeed, that it is more the capacity readily to shift from one attentional level to another that is impaired, than a problem of global or local attention *per se*;⁴⁰ and the reader will be familiar with the idea that left hemisphere attention is less flexible. It should not be forgotten, however, that to see the whole in itself already requires seeing parts and whole together: appreciation of both a context for everything and of everything in its context.

When you can no longer perceive the whole *as* an indivisible whole, it breaks up into a mass of mere meaningless *things*. Not seeing the whole means that you don’t see the context; and one way of looking at it is that such a deficit is ‘but one manifestation of a widespread impairment in cognitive co-ordination – the grouping of information based on *contextual* relationships’.⁴¹

Deficits in context appreciation may be central to a number of cognitive problems experienced by schizophrenic subjects.⁴² And since this is a matter of attention, not just vision, problems with understanding context occur in other modalities,⁴³ such as audition, and of course in language comprehension.⁴⁴ In other words, difficulties occur right across mental space, not just physical space.⁴⁵

As a corollary, schizophrenic subjects are actually better than normal subjects in a situation where seeing the whole interferes with seeing a part,⁴⁶ and in laboratory situations where context is set up to be misleading, as in certain visual illusions to which neurotypical individuals are susceptible, schizophrenic and autistic subjects are relatively resistant to the illusion.⁴⁷

Both right hemisphere-damaged subjects and schizophrenics, intriguingly, lack an intuitive sense of the reality or substantiality of experience, sometimes feeling that it is all ‘play-acting’. Both can experience a loss of the sense of the unique person, place or object. Above all, they have a similar lack of what might be called common sense. Two statements most commonly endorsed by schizophrenics were: ‘I cannot immediately recognise other people’s faces’ and ‘I have no common sense’,⁴⁸ both of which refer to capacities that are highly right hemisphere-dependent. And, as I wrote in *The Master and his Emissary*, in both groups

there is a loss of the stabilising, coherence-giving, framework-building role that the right hemisphere fulfils in normal individuals. Both exhibit a reduction in pre-attentive processing and an increase in narrowly focussed attention, which is particularistic, over-intellectualising and inappropriately deliberate in approach. Both rely on piece-meal decontextualised analysis, rather than on an intuitive, spontaneous or global mode of apprehension. Both tend to schematise – for example, to scrutinise the behaviour of others, rather as a visitor from another culture might, to discover the ‘rules’ which explain their behaviour. The living become machine-like: as if to confirm the primacy of the left hemisphere’s view of the world, one schizophrenic patient described by Sass reported that ‘the world consists of tools, and ... everything that we glance at has some utilization’.⁴⁹

Significantly, it has been noted for years that one of the underlying mental habits of schizophrenic patients, as in right hemisphere-damaged patients, is jumping to conclusions (and delusional reference to the self).⁵⁰ Indeed a delusion could be seen as a conclusion that has been jumped to on little or no evidence, and has then *stuck* (both the jumping to conclusions

and the ‘stickiness’ are suggestive of left hemisphere involvement). Nearly half of all people with delusions jump to conclusions at the least suggestion, demonstrating ‘an extreme data gathering bias’.⁵¹ It has been suggested that the extent of this phenomenon is a predictor of (poorer) prognosis and response to treatment among those with psychotic illnesses.⁵²

In keeping with the stickiness of the left hemisphere that we have already observed, in schizophrenia images persist for longer;⁵³ and the attentional blink, prolonged in right hemisphere damage, is also prolonged in schizophrenic subjects.⁵⁴ I mentioned earlier that stickiness of gaze, getting locked onto a target, occurs in both right hemisphere damage and schizophrenia. By way of illustration, a schizophrenic patient says: ‘Sometimes an object really seems to stand out from the rest of what I see. My eyes then fix on it. It’s like being spellbound, even though I don’t want to look at it at all.’⁵⁵

Finally, some evidence that tends, if no more, to confirm the picture comes from a large study of somatic delusions in psychotic illnesses, in which John Cutting and I analysed the bodily delusions, hallucinations and misperceptions of 550 psychotic patients (250 with acute schizophrenia, and 100 each with chronic schizophrenia, depression and mania).⁵⁶ We identified 37 sub-categories of delusions affecting 40 parts of the body. As part of the study we examined lateralisation of delusional phenomena: in schizophrenia, where a single side of the body was specified, in over 80% of cases it was on the left, suggesting right hemisphere dysfunction. (A case familiar to the public, not studied by us, was that of John Nash, subject of Sylvia Nasar’s *A Beautiful Mind*, who believed he was the *left foot* of God.)⁵⁷ In depression, on the other hand, there were six cases where the side of the body was specified, and there every one of them was located on the right side, suggesting left hemisphere dysfunction (a known association of depression). This is in keeping with other research in the area.⁵⁸

The differences were not, however, just in the location, but the nature, of the patient’s reported complaint. In schizophrenia, the complaint was, in a fashion characteristic of the left hemisphere, both very detailed and very bizarre: half the spleen was missing, body parts were made of glass, there was an aeroplane glued in her ear, an extra arm growing out of his chest (imagery suggestive of the work of a twentieth-century Hieronymus Bosch). It is also often technical: it is a consistent observation of mine that

when a patient talks of his or her ‘brain’ rather than his or her ‘mind’, the diagnosis is more likely to prove to be on the schizo-autistic spectrum.⁵⁹ By contrast, all the delusions in depression, where there was presumed left hemisphere dysfunction, referred in an understandable way, characteristic of the right hemisphere, to the mind, and did so in an appropriately non-specific way – ‘something wrong with the right side of my head’, ‘mind not working on the right side’, and so on.⁶⁰ Depressive delusions in general concern *malfunction*, usually of the head, or mind, but also of the bowels: close enough to reality (since both depression and its treatments have effects on bowel function), and certainly understandable, even if not strictly the case. They are to do with the *process* of a *whole*. On the other hand, schizophrenic delusions, being left hemisphere-driven, generally concerned gross *structural* changes, and these changes were to body *parts* – and are not generally understandable.⁶¹

SCHIZOPHRENIA AND RIGHT HEMISPHERE DEFICIT SYNDROMES: BRAIN CORRELATES

First, an important caveat that needs to be taken into account when deciding how to weigh lateralised findings, especially from neuroimaging, in schizophrenia. Despite its importance, it has not been sufficiently discussed in the literature. The similarity between schizophrenia and right hemisphere damage does not necessarily imply that individual schizophrenics simply do have deficits in their right hemisphere or overactivity in their left hemisphere – *precisely because one characteristic feature of schizophrenia is that the brain is no longer lateralised in the normal way*. The hemisphere that is situated on the right may be functioning for this patient rather more like a left hemisphere, and vice versa; or, most probably, each may incorporate aspects of the functioning of both hemispheres. This makes evidence on lateralisation at the level of anatomy or physiology in schizophrenia harder to interpret than the phenomenology.

The picture, then, is complex and abnormalities are certainly not confined to one hemisphere. That said, schizophrenic subjects, and even their first-degree relatives in some cases, do show a wide range of structural abnormalities in the right hemisphere, especially in frontal and parietal areas; the interested reader is referred to the notes here for further detail.⁶² Hallucinations and disturbances of the self in schizophrenia are particularly associated with right frontal and parietal regions.⁶³ Disruption of communication between the right hippocampus and orbitofrontal cortex has been implicated in the pathogenesis of delusions in schizophrenia.⁶⁴

Some characteristic neuropsychological deficits in schizophrenia are associated with right frontal hypometabolism,⁶⁵ not to mention biochemical⁶⁶ and electrophysiological⁶⁷ abnormalities in the same region, and in the right hemisphere more widely; and a brain dysfunction centred on the right temporal region has been found to characterise treatment-refractory schizophrenics.⁶⁸

There are marked differences between gene expression in the right frontal pole and the left frontal pole of the brain in the normal subject. This is related to the expansion of the right frontal cortex relative to the left, the largest anatomical asymmetry in the brain, and is particularly responsible

for greater right-sided neuronal plasticity. There are 35 protein-coding genes expressed in the most anterior part of the frontal cortex (known as Brodmann area 10) on the right, and only five on the left. And here's the thing: 'strikingly, the vast majority of these differentially expressed genes were implicated in pathogenesis of one single disorder: 24 out of 30 genes were disrupted in schizophrenia.'⁶⁹ There are links, then, between the genes involved in producing normal brain asymmetry (via, but not confined to, expansion of the right frontal cortex), and the genesis of schizophrenia. Thus it is of no small interest that in schizophrenia – and in autism – there is a very well-attested loss, or even reversal, of normal hemispheric asymmetry, both anatomically and to some extent functionally.⁷⁰

I mentioned in Chapter 1 that transmission from right hemisphere to left is faster than from left to right. However, this effect is lost, or even reversed, in schizophrenic subjects, possibly because of failure of adequate myelination of the long tracts of the right hemisphere.⁷¹ The degree to which normal brain asymmetry is lost or reversed correlates with the severity of what is called the 'disorganisation' syndrome, in which patients are grossly out of touch with reality, whether hallucinating and delusional or not; and patients with hallucinations and delusions, too, show highly significant leftward functional asymmetry in the resting state.⁷²

Equally, loss of the normal anatomical asymmetry is manifest in those areas where there *should* normally be a greater left-sided volume – the areas responsible for language, in the temporoparietal region, especially what is called the planum temporale.⁷³ This is no doubt one factor that is related to impaired linguistic function in schizophrenia. In either direction, then, there are abnormalities of asymmetry which affect differentiated hemisphere functioning.

As the reader has seen, the right hemisphere is largely responsible, in a host of ways, for sustaining the lived world we inhabit, while the left hemisphere deals mainly with a theoretical schema or map – a representation only. So one way of looking at schizophrenia would be this: the subject is struggling with a left hemisphere whose linguistic and conceptual functioning is impaired by the encroachment on it of what should be going on separately in the right hemisphere; and meanwhile the reality-orientated functioning of the right hemisphere is impaired by the intrusion into it of what should be going on separately in the left.⁷⁴ You might think of it as like trying to map what you are living, instead of living

it – and at the same time trying to live in the map. So, yes, language is sometimes awry in schizophrenia. But much more significantly, and more revealingly for us, so is comprehension of the real world.

Interest has also increasingly transferred to problems of interconnectivity *between* regions, rather than simply regions in themselves: to systems rather than modules. Some phenomena characteristic of schizophrenia may result from abnormalities in glutamatergic transmission, or in white matter tracts, or in both.⁷⁵ There are well-known abnormalities of the corpus callosum, the brain's largest white matter structure, in subjects with schizophrenia.⁷⁶ While the precise nature of the relationship between them remains uncertain, to quote one review

it is likely that whatever the cerebral basis of schizophrenia turns out to be, the corpus callosum, the largest connecting tract of the human brain, is bound to reflect this. Similarly, a primary disturbance in [callosal] development will impinge on many other cortical structures.⁷⁷

It is a matter of interest that large white matter tracts, such as the superior longitudinal fasciculus, that integrate functioning between anterior and posterior regions of each hemisphere, come to their full potential only when they are myelinated in the late teens and early 20s – precisely when schizophrenia tends to become manifest. Abnormalities of myelination in schizophrenia are well established; equally, hypofunction of such tracts, principally those of the right hemisphere, has been implicated in schizophrenia.⁷⁸

Meanwhile, left hemisphere hyperactivation has been demonstrated in schizophrenia;⁷⁹ and research on cerebral metabolism has confirmed that individuals on the schizophrenia spectrum tend to overactivate the left hemisphere, relying on it in circumstances in which it would be more usual to rely on the right.⁸⁰ Symptom severity in schizophrenia has been found to correlate with left hemisphere activation. Not coincidentally, the most effective treatment for schizophrenia (and mania) are classes of medication, used across the world for decades, which amongst other things induce a shift in the balance of perfusion from the left hemisphere to the right, and bring with them insight and healing.⁸¹ These are dopamine antagonists

(blockers): the left hemisphere relies more heavily on dopamine than does the right hemisphere.⁸² In schizophrenic patients, this balance of left over right dopaminergic activity is still more marked throughout the basal ganglia, though especially in the striatum, an important ‘powerhouse’ that is involved in co-ordinating many aspects of perception, motivation, motion and higher cognitive function.⁸³

Intellectual asymmetry, with a relative superiority of (typically LH) verbal skills over (typically RH) spatial skills, is commoner in schizophrenic subjects⁸⁴ and their relatives.⁸⁵

In schizophrenia, subjects tend to exhibit deficits typical of patients with right-brain damage. For example, they tend to neglect the left visual field.⁸⁶ On a line bisection task, which normally reveals dominance of the right hemisphere for visuo-spatial function, schizophrenic subjects perform like people with right hemisphere brain damage.⁸⁷ We have seen already (in Chapter 4) the extraordinary preponderance of right hemisphere strokes in the genesis of schizophrenia-like delusions in otherwise neurotypical subjects. In accordance with this, a small study showed that stimulating the right hemisphere, but not the left hemisphere, can cause temporary remission of delusions, and increase in insight (into the fact of being ill) in both manic and schizophrenic subjects.⁸⁸

Amazingly, there are published records of cases in which the delusions of a schizophrenic patient *disappear after a left hemisphere stroke*.⁸⁹ I am grateful to a colleague for bringing an additional, personal and hitherto unreported case to my notice. Her patient had a diagnosis of schizophrenia, and was bizarre, exhibiting delusional misidentification symptoms, thought block and auditory hallucinations, over many years. One day he presented complaining of slurred speech. ‘What struck me’, she writes, ‘was that for the first time ever he was interacting normally.’ There was no evidence of thought block or hallucinations, no delusions. He *engaged* with her for the first time. However, she wondered if he had had a left hemisphere stroke. She sent him for a scan, which revealed a left-sided pontine infarction. ‘For the next four months he continued to be his new character, and his schizophrenia was in remission.’ Sadly, however, as his left hemisphere recovered its function, his psychosis returned.

In summary, while there are undoubtedly abnormalities to be found in the structure and function of both right and left hemispheres in

schizophrenia, such evidence, for what it is worth, points sufficiently strongly towards right hemisphere deficits, resulting in exaggerated left hemisphere prepotency, to confirm the overwhelming phenomenological evidence. Let me put it like this: if, in the thankfully improbable circumstance that you wanted to take a 'normal' brain, and make its possessor behave like someone with schizophrenia, you would find yourself creating lesions mainly in the right hemisphere.

AUTISM AND RIGHT HEMISPHERE DEFICIT SYNDROMES: PHENOMENOLOGY

Readers who know people with some form of autism will recognise many parallels. The concept of 'autism', meaning a morbid self-absorption (from Greek *autos*, self) and a lack of contact with reality, is a core feature of schizophrenia.⁹⁰ The term was coined by Eugen Bleuler in 1908 to describe an aspect of schizophrenia, and was not applied in its current sense, to a developmental disorder first manifest in childhood, till Leo Kanner did so in 1943. Kanner thought that, while the conditions were obviously distinct and had a different chronology, there were 'remarkable similarities' with schizophrenia: some of those he noted were insularity, a desire for sameness, a deviance from normal pronoun use, a difficulty with understanding the intentions and viewpoint of others, a total lack of interest in people and an obsession with the inanimate.⁹¹ Kanner's classic paper, in which he first described the syndrome, noted as central to autism an

inability to experience wholes without full attention to the constituent parts. ... A situation, a performance, a sentence is not regarded as complete if it is not made up of exactly the same elements that were present at the time the child was first confronted with it.⁹²

Autism, like schizophrenia, is characterised by perceptual organisation deficits.⁹³ Indeed, one of the cardinal features common to schizophrenia, autism and right hemisphere dysfunction is the primacy of local over global attention.⁹⁴ There is in autism an inability to appreciate global information, or to integrate global, contextual information with local information, which is almost identical with that found in schizophrenia.⁹⁵ Kanner thought that the inability to experience wholes without full attention to the constituent parts was central to the condition.⁹⁶ The elements of insistence on sameness, an attention to parts of objects, a fascination with inanimate objects, and an uneven cognitive profile, may all be aspects of what has

been called ‘weak coherence’ – an over-emphasis on detail with respect to the whole.⁹⁷

Kanner also remarked on a fastidious refusal of food (interestingly parallels between autistic spectrum disorders and anorexia nervosa at many levels have been suggested more recently).⁹⁸ People with autism, who have difficulty with pronouns, and often refer to themselves, or to others in their presence, in the third person, show right hemisphere deficits in perspective-taking.⁹⁹ When neurotypical (normal) subjects hear or read a story, and take different perspectives, it is areas of the right hemisphere that underpin this; such right hemisphere functions appear to be impaired in autism.¹⁰⁰

As the reader will appreciate from earlier chapters, both autism and Asperger’s syndrome, which is part of the autism spectrum, have many features in common with right hemisphere dysfunction.¹⁰¹ Children that have neurological and neuropsychological right hemisphere deficits often display features of autism, such as solitariness, ‘oddness’, and difficulties in emotional expression and interpersonal relationships.¹⁰² Conversely, an overview of autism from a neuropsychological perspective emphasises that a host of features of autism are found in right, but not left, hemisphere deficit syndromes. These include abnormalities in:

gaze following, response to sound and deficits in attention,¹⁰³ showing of objects, responding and orienting to own name,¹⁰⁴ looking at other’s faces,¹⁰⁵ pretend play, proto-declarative pointing [pointing to draw the attention of another person to an object of interest in itself – ‘doggy!’ – by comparison with proto-imperative pointing, which is instrumental in demanding something – ‘biscuit!'] and gaze monitoring,¹⁰⁶ empathy and imitation,¹⁰⁷ joint-attention behaviour,¹⁰⁸ affect and personal relatedness,¹⁰⁹ self-awareness including self-recognition, self-other differentiation, body awareness, theory of mind, inter-subjectivity, ego/allocentrism, motion processing, language (pronoun reversal, inner speech, third-person perspective), self stability over time, autobiographical memory and narrative self ...¹¹⁰

Kanner also observed of autistic children that

they all come of highly intelligent families ... this much is certain, that there is a great deal of obsessiveness in the family background ... one other fact stands out prominently. In the whole group, there are very few really warmhearted fathers and mothers.¹¹¹

It is relevant that the important areas for mother-infant attachment, recognition of the mother's face and voice, and of self-other distinction are all in the right hemisphere, which is normally dominant in early childhood.¹¹² These areas are thought to be crucial for the development of a socially integrated human being. They are not functioning at the normal level in schizophrenia and autism.

Lyons & Fitzgerald conclude that their 'review of neural substrates underlying these processes has highlighted the significance of the right hemisphere ... right hemisphere impairment leads to a dysfunctional self-development in autism spectrum disorders.'¹¹³

And Allan Schore concludes that, while both hemispheres are 'affected by a common neuropathological process, at the core, autism represents a severe impairment of the right-lateralized cortical-subcortical implicit self system that acts unconsciously'.¹¹⁴

AUTISM AND RIGHT HEMISPHERE DEFICIT SYNDROMES: BRAIN CORRELATES

As mentioned, there appears to be a genetic overlap between schizophrenia and autism, each being over-represented in the lineage of the other. Abnormalities in right hemisphere structure and function are increasingly being reported in autism spectrum disorders (see note for details).¹¹⁵ Children with such disorders have reduced lateralisation. In neurotypical children, activity is ‘more integrative in the right and more specialized in the left hemisphere’: this well-characterised asymmetry is diminished in autistic spectrum subjects.¹¹⁶ In such subjects, social awkwardness¹¹⁷ and an inability to understand one’s own mental state¹¹⁸ are specifically associated with dysfunction in the right hemisphere (principally the temporoparietal region).¹¹⁹

There is reduction in white matter conductivity in autism.¹²⁰ Abnormalities in the extended white matter tracts of the right hemisphere have been implicated in the genesis of the condition: ‘the finding of microstructural abnormalities in the right inferior fronto-occipital fasciculus in autism spectrum disorders is exciting as it offers an insight into white matter abnormalities that may underpin a core deficit in the condition’.¹²¹

EEG studies in autistic spectrum disorders have also demonstrated largely right hemisphere deficits: a broad leftward asymmetry has been observed in subjects relative to normal subjects, especially in the temporal region, thought to reflect a failure of the right temporal region to generate EEG rhythms.¹²² Another study found a decrease in resting gamma power in the lateral leads over the right hemisphere.¹²³ Dysfunction primarily in right posterior regions has also been repeatedly observed.¹²⁴ Conversely, there is both abnormal functional connectivity and enhanced power in the left hemisphere.¹²⁵

In autism spectrum disorders there is a tendency for ‘over-connectivity in the local networks and under-connectivity in the long-distance networks.’¹²⁶ This is also one way of characterising respectively the left hemisphere’s neuronal architecture (shorter distance connexions) compared with that of the right (longer distance connexions).¹²⁷ It would go some

way to explaining the abnormal focus on detail at the expense of the big picture in such disorders (and schizophrenia).

Agenesis of the corpus callosum – absence of the corpus callosum from birth – occurs in at least 1 in 4,000 individuals, probably more, since many cases go undetected during life.¹²⁸ In general, individuals with the syndrome do not exhibit the same clinical picture as that found in split-brain patients, perhaps because during development the brain is plastic and undergoes reorganisation, allowing for the possibility of bilateral representations of language or visuo-spatial imagery;¹²⁹ and interhemispheric communication (although much slower) via other pathways such as the anterior commissure, and even via the cerebellum, may compensate.¹³⁰ However, intriguingly enough, many subjects with the condition do resemble individuals with *autism*.

Like those with autism, subjects with callosal agenesis exhibit deficits in language comprehension, especially in interpreting metaphor, humour, idiomatic phrases and proverbs, as well as tone of voice and body language. Many seem unable to get beyond literal interpretation, and to have difficulties understanding how meaning depends on context.¹³¹ Also like autistic (and schizophrenic) subjects, they have pronounced difficulty understanding social situations,¹³² difficulty imagining the social perspective of others,¹³³ a lack of self-awareness,¹³⁴ poor conversational skills¹³⁵ and problems verbalising emotional experience.¹³⁶ Like some, but by no means all, autistic individuals, they have been found to be slow at problem-solving, tend to have a low IQ and have associated difficulties in reasoning.¹³⁷ A recent comprehensive review of the area suggests that ‘congenital disruption of the corpus callosum constitutes a major risk factor for developing autism.’ The authors found that approximately a third of adults with agenesis of the corpus callosum showed the clinical diagnostic picture of an autism spectrum disorder.¹³⁸

If autism is common in callosal agenesis, abnormalities of the corpus callosum are common in autism.¹³⁹ Some studies have found only parts of it to be affected,¹⁴⁰ while others report reduced corpus callosum cross-sectional volume throughout the entire structure.¹⁴¹ However the salience of details, coupled to a difficulty in perceiving the whole, may be related not so much to reduced *interhemispheric* connectivity, as to reduced *intra*hemispheric connectivity, in autism – a further consequence of reduced

white matter volumes. Certainly, any alteration in the efficacy of the neuronal connexions carried by the corpus callosum will alter the hemisphere balance directly.^{[142](#)}

Impairment of the right hemisphere's capacity to inhibit the left hemisphere could result in functional interference likely to impinge particularly badly on the right hemisphere. From cases of early unilateral brain damage, epilepsy or hemispherectomy in childhood, where therefore one hemisphere then takes over the functions of both, we find that it is the typically right hemisphere aspects that tend to get squeezed out in favour of those of the left hemisphere, a phenomenon known as 'crowding' by language.^{[143](#)}

HEMISPHERES OR MODULES?

You may be thinking it odd that different conditions, with differing underlying pathologies, should eventuate in similar clinical pictures. But I suggest that that surprise stems from a misunderstanding of what we are dealing with.

The point is that though there may be a virtually infinite number of causes of a complex system's malfunctioning, there are only so many ways in which that malfunction can manifest itself. There are relatively few 'final common pathways'. To take a simple example, anything from a driver's turning up late, to a fuel leak, a suicide or a national strike (each of them in itself the result of any one of a myriad causes) will lead to the same result: your train is late. We are very much more complicated than the rail system, so there are more outcomes possible, but they are still drastically limited compared with the potential causes.

The brain is a series of nested neuronal complexes: nuclei and ganglia at one level, organisational foci, and broader functional regions within specific gyri or sulci (the folds of the cortex) at another, up to the level of one or other cerebral hemisphere as a whole. As I have noted, each hemisphere is capable of sustaining consciousness on its own, and each is one of the two most massively internally connected neuronal complexes on which we rely. If, at the very top of the pyramid of functioning of the human central nervous system, the product of all this organisation is the phenomenological world we inhabit (and which we also help to constitute), and if that product, as I suggest, requires balancing the contributions of the two hemispheres, an imbalance of some kind between the two will be a common element in mind/brain abnormalities. Which is not at all, of course, to say that all such abnormalities are the same, or that there will not also be tell-tale symptoms guiding us to a more specific diagnosis: there will be. But there should nonetheless be what Wittgenstein called 'family resemblances'.

Just stimulating a part of one hemisphere alters the overall balance between hemispheres. As Marcel Kinsbourne writes:

When use of a specialised part of a hemisphere is called for, it is activated by ascending pathways. This activation is not limited to

the specialised hemispheric area, but, presumably on account of the network characteristic of brain organisation, involves other parts of the hemisphere as well.¹⁴⁴

I have mentioned the stimulation of an entire hemisphere's function by administering ice water to the external auditory meatus of the contralateral hemisphere: caloric vestibular stimulation.

There is also a phenomenon, which the famous Swiss-Russian neuropathologist Constantin von Monakow termed 'diaschisis', a word which means 'distributed damage', and which has gone into the language of neurology.¹⁴⁵ It refers to the fact that damage to one area of the brain often results in much more widespread deficits, taking in areas that are only distantly, although functionally, connected with it. This concept has recently been revived, after neglect during a period of excessive focus on narrow localisation.¹⁴⁶

Two striking examples show why thinking at the hemisphere level is not only valid but of crucial importance.

In Chapter 4, I mentioned a systematic review of post-stroke psychosis.¹⁴⁷ The authors found that the regions affected were right frontal (30 patients), right temporal (26 patients) and right parietal (40 patients), as well as the right caudate nucleus (14 patients). That's quite a spread – only one region of the right hemisphere (occipital lobe) does not figure here as causing psychosis if damaged. (But it can.)¹⁴⁸

You might think that that is because psychosis is a rather broad concept. However, the same applies with a more circumscribed phenomenon such as appreciation of metaphor; research has implicated equally the right frontal and prefrontal cortex, right temporal, right parietal and right occipital regions. Again widespread hemispheric networks are responsible.

The overall point I am making here is that each hemisphere is profusely interconnected within itself, and that there is a tendency for apparently circumscribed lesions in different areas to give rise to similar manifestations, because interconnectivity means that the effects of a lesion are never functionally as localised as might be expected from the point of view of gross anatomy. Thus many different lesions may have similar, though rarely identical, ultimate consequences.

Overall, then, a pervasive over-localising tendency in brain research into schizophrenia and autism may lead one to miss real and important effects. Even relatively focal brain abnormalities tend to be reflected in hemisphere imbalance, and in the case of the long white matter tracts this will be still more likely to be the case.

Finally, one repeated clinical observation of mine offers perhaps some support both to the connexion between schizophrenia and right hemisphere dysfunction (as well as some cases of depression and left hemisphere dysfunction), and the idea that the dysfunction is widespread in the relevant hemisphere, rather than purely localised. This is the frequency with which psychotic patients refer to a subjective sense of hemisphere imbalance, almost as if they were able to diagnose their own condition. A beautiful example is provided by a patient of the contemporary phenomenologist Giovanni Stanghellini:

Twenty years ago. I heard a voice saying ‘You’ve got a hole!’ and the whole world deflated like a beachball ... Flattened, like a map – if it weren’t for the folds ... it was like a pinprick, something quite simple, here, on the right-hand side of my brain... ¹⁴⁹

Its richness lies partly in its reference to the ‘deflation’ of the right side of the brain; but it is also in the allusion to the sense in which the left hemisphere could be said to see not the world, but a map of the world, and to its related tendency to see the world flattened out – lacking in depth.

In psychotic subjects, those with schizophrenic delusions appear to intuit an imbalance. If the mind is functioning normally, with the right hemisphere as the Master, the working of the two hemispheres is experienced as integrated (according to the right hemisphere’s integrative character); if not, the division of, even antagonism between, these two modes of being is felt (according to the left hemisphere’s ‘either/or’ character). Cutting and Dunne report the cases of six schizophrenic patients who described simultaneous experience of two separate modes of thinking:

- ‘I began to be more aware of things– I was in two minds – I could snap out of it if I wanted’;

- ‘I was functioning on another level, one more in pictures, then another one – the abnormal one was the picture one’;
- ‘rational thinking was not right – there was my own personality and another one’;
- ‘mind working terribly, one was the natural working of my mind, me myself or me not myself boosting myself’;
- ‘parts of it were working, different wavelengths, two different wavelengths’;
- ‘my mind clicked into another sort of thing’.¹⁵⁰

Another patient reported that his ‘consciousness is not as whole as it should be ... I am *half* awake.’¹⁵¹ Still another that ‘the one speaking now is the *wrong ego* ... ’¹⁵²

Patients refer to ‘pressure over left side of head’, ‘things look odd in left visual field’, ‘thoughts positioned over left shoulder, connected to brain by strand’.¹⁵³ One schizophrenic patient reported that his ‘right side [was] empty’; another was ‘fogged up on left, nothing on right’. Interestingly, another complained that the ‘left side connects with the right side’; and still another that he got a right-sided headache when depressed and a left-sided one when ‘thoughts are positive’.¹⁵⁴ Other studies of schizophrenia contain similar reports of abnormal subjective lateralisation: ‘I have a feeling that my left and right forearms have switched places.’¹⁵⁵ (Notice not the arms, just the forearms, in accord with the characteristic part-orientation of the left hemisphere.)

Daniel Schreber, the subject of Freud’s only study of schizophrenia, describes in his memoirs a disruption of hemisphere relations: ‘In consequence of many flights of rays, etc, there has appeared in my skull a deep cleft or rent along the middle, which probably was not visible from outside but was from inside.’¹⁵⁶ Not dissimilarly, a woman described by Franz Gall in the 1830s insisted that

she perceived every thing differently with her left side from what she did with the right; that every thing affected her differently on different sides ... that sometimes her faculty of thinking was completely shackled on that side, and that this inability was accompanied by an icy torpor: it seems to me (these are her own

words, and she applied her hand perpendicularly upon the middle of her forehead) that from the front to the back of my head, the brain is divided into two distinct halves. 157

THE WORLD OF THE SCHIZOPHRENIC SUBJECT

A lot of things happen to the world in schizophrenia (and in autism): to the sense of the whole, of context, of the relation between mind and body; to the sense of connectedness to, and belonging in, the world; to one's relatedness to other human beings; to the sense of animacy; to what one might call the sense of naturalness, spontaneity and vitality; and to the very existence of the self.¹⁵⁸ Each of these aspects of experience is also compromised in right hemisphere damage; and problems with each of them are also recognisable, I believe, in the modern Western world, and have even become the focus of much of its literature and art in the last hundred years or so, as Louis Sass suggests.

I concur with Cutting that the Franco-Polish psychiatrist and philosopher Eugène Minkowski provides 'the most comprehensive psychological account of schizophrenia ever written'; and that 'his observations are so accurate and profound' that they anticipate and bear out not only current neuropsychological models of schizophrenia, but confirm contemporary neuropsychological theories of the functioning of the mind and brain in its normal state.¹⁵⁹ RD Laing called Minkowski's work 'the first serious attempt in psychiatry to reconstruct the other person's lived experience', and I would add that it is still the most important attempt ever made.¹⁶⁰

Minkowski immediately recognised the importance of abnormalities in the experience of time in schizophrenia, an important theme of the philosopher Henri Bergson, which I will come to in Chapter 22; both this and another foundational aspect of Bergson's thinking, the distinction, which he arrived at by introspection, between what we now know to be the left hemisphere's take (which he called *intellect*) and the right hemisphere's take (which he called *intuition*). When Minkowski applied the difference between *intellect* and *intuition* to the world of schizophrenia, he discovered in effect that for the schizophrenic subject Bergson's *intuition* becomes atrophied, and Bergson's *intellect* becomes hypertrophied (exaggerated). And he gives these antithetical pairings (which could stand for right versus left hemisphere) as characteristic of schizophrenia: ¹⁶¹

ATROPHIED	HYPERTROPHIED
<i>life</i>	<i>map</i>
<i>instinct</i>	<i>brain</i>
<i>feeling</i>	<i>thought</i>
<i>'faculty of penetration which synthesises'</i>	<i>'analysis of infinite details'</i>
<i>trust in impressions</i>	<i>demand for proof</i>
<i>movement</i>	<i>immobility</i>
<i>events and persons</i>	<i>objects</i>
<i>presence</i>	<i>representation</i>
<i>goal</i>	<i>preliminaries</i>
<i>time</i>	<i>space</i>
<i>flow</i>	<i>measure</i>

I believe, to varying degrees, this shift has become characteristic of the way we live now. In fact if you look at the list on the left, it characterises embodied vitality; on the right, it characterises the dead hand of mechanism, scientism and bureaucracy, under the shadow of which all our lives are now 'lived'. The Swiss psychopathologist Roland Kuhn saw, at the core of psychosis, 'an inauthentic materialisation, technicalisation and mechanisation of everything'.¹⁶² That suggests there is an imbalance verging on mental illness in our current society, since these are some of its most prominent characteristics.

In what follows I will examine some abnormal aspects of the phenomenological world in schizophrenia, shared by the right hemisphere-damaged subject, and indicative, though in an extreme form, of some of the characteristic tendencies of the contemporary world.

Things fall apart

Given the centrality of deficits in attention to the whole in schizophrenia, autism and right hemisphere damage, let's begin by looking at what happens to our capacity to understand the world when fragmented attention is all we have to go on.

In a word, there is deluge. Temple Grandin, who has written illuminatingly about her autism, describes how her 'mind works similar to an Internet search engine', and how for a long time, in 'everything in life, I was overwhelmed with a mass of details'.¹⁶³ Minkowski reports one of his

schizophrenic patients as telling him that ‘whoever speaks of a clock speaks of the hands, cogs, springs, case, pendulum, etc ... His mind ... decomposed every object that it met.’ ¹⁶⁴ Detail triumphs at the expense of the whole: ‘I am overwhelmed by too much detail’, records one schizophrenic subject, ‘too much detail in objects’. ¹⁶⁵ Remember that in autism any situation, any sentence, is not regarded as complete if it is not made up of *exactly the same* elements that were present at the time the individual first encountered it. ¹⁶⁶ The sense of the whole is lost.

Elyn Saks gives a vivid report of her own experience during a psychotic episode:

Consciousness gradually loses its coherence. One’s centre gives way. The centre cannot hold ... No core holds things together, providing the lens through which to see the world, to make judgments and comprehend risk. Random moments of time follow one another. Sights, sounds, thoughts, and feelings don’t go together. No organizing principle takes successive moments in time and puts them together in a coherent way from which sense can be made. ¹⁶⁷

As a result of the loss of integrative imagination, there is no proper hierarchy of attention: there is no way of constructing a coherent picture in which irrelevancies can be detected and excluded. Instead every detail stands out as equally important, demanding attention in its own right, and the result is an overload of distracting fragments. Here is the report of a schizophrenic patient:

Everything seems to grip my attention although I’m not particularly interested in anything. I am speaking to you just now but I can hear noises going on next door and in the corridor. I find it difficult to shut them out and it makes it more difficult for me to concentrate on what I’m saying to you. Often the silliest little things that are going on seem to interest me. That’s not even true; they don’t interest me but I find myself attending to them and wasting a lot of time this way. I know that sounds like laziness, but it’s not really. ¹⁶⁸

This again seems to describe an aspect of the modern, information-soused, overstimulated, condition. As in modern life, there is no hierarchy of importance, but a democracy of the importunate. A different patient says:

I was surrounded by a multitude of meaningless details ... I did not see things as a whole. I only saw fragments: a few people, a dairy, a dreary house ... They did not stand together in overall context ... My impressions did not flow as they normally do. If I had not continuously reminded myself of where I was going, I would just as gladly have stood still somewhere.¹⁶⁹

Losing any sense of the whole is bound up closely with two other phenomena: the living flow of time, of seamless experience, is lost; and, cut off from vitality, intuition, emotion and the body, it becomes static and abstract, as if only conscious mental effort can recompose it once more. Of one patient, the psychiatrist Françoise Minkowska writes:

All his activity is governed by the idea of a strategy which inevitably applies only to immovable objects: our patient has no grasp of the whole, he sees only isolated parts and gets nowhere. In developing his plan, he relies purely on his powers of cerebration, since *instinct*, as he says, *has gone missing*. Speaking of music one day, he declares that for him it is no more than a succession of sounds: '*I don't know how to feel – everything has to go through my brain.*'¹⁷⁰

The sense of direction, purpose and overarching meaning, necessary for inhabiting time and experiencing music, are lost. Another patient reported: 'I may look at the garden, but I don't see it as I normally do. I can only concentrate on details. For instance I can lose myself in looking at a bird on a branch, but then I don't see anything else.'¹⁷¹ Yet another 'could not look at the whole door ... She could only see the knob or the keyhole or some corner of the door. The wall too had to be fragmented into parts.'¹⁷²

This has the effect of breaking up the whole experienced world, with particularly damaging effects on the *living* world: loss of the seamless flow of experience. 'Everything I see is split up', complained another patient:

it's like a photograph that's torn in bits and put together again. If somebody moves or speaks, everything I see disappears quickly and I have to put it together again.¹⁷³

There is, then, a need for effortful *recomposition* to make the whole comprehensible. Meaning which comes from perceiving the whole has to be effortfully recaptured (if it can be at all) by adding pieces of information together. This too seems to me part of the modern predicament. In the words of patients themselves:

- It's like eating a soup where you taste the individual ingredients: you taste the flavour of the soup itself only after *reconstructing* it.¹⁷⁴
- I have to put things together in my head. If I look at my watch I see the watch, watchstrap, face, hands and so on, then I have got to *put them together* to get it into one piece.¹⁷⁵
- I can concentrate quite well in [*sic*] what people are saying if they talk simply. It's when they go on into long sentences that I lose the meanings. It just becomes a lot of words that I would need to *string together* to make sense.¹⁷⁶
- It's the same with listening. You only hear snatches of conversation and you can't *fit them together*.¹⁷⁷

Time slows or disappears once it is represented as 'fractured':

Time has disappeared. Not that is longer or shorter, it's just not there; you could say there are bits of time, small pieces, *shaken and mingled*, or you could say there is no time at all.¹⁷⁸

The phenomenon of fragmentation affects everything. It probably results from at least three related deficits in schizophrenia, which are also deficits in the modern world-picture: loss of global or *Gestalt* perception, as we have seen; deficits in contextual understanding; and difficulty discriminating familiar from strange stimuli (all right hemisphere-related deficits).¹⁷⁹ Fragmentation renders things uncanny, alien – including the

embodied self. ‘I feel my body breaking up into bits’, says one schizophrenic subject.¹⁸⁰ Remember that knowledge of the body as parts, rather than as a whole, is dependent on the left parietal region – which is here acting without the countervailing sense of the whole, the body schema, provided by the right parietal region.

Alienation from the body

Fragmentation affects the union of mind and body, body and soul. Schizophrenia could be seen as ‘involving extreme disembodiment, a sense of radical separation from one’s own being as a physical entity’.¹⁸¹ One patient says,

I feel distant from myself ... It’s as if the body were there by itself, without being co-ordinated with anything else... I have this feeling of un-harmony, of a separation from my inside, which is where I feel the vital force flowing ... Sometimes it’s as if I weren’t the one who’s thinking... The body is something that functions, not something that’s mine that I live ... I live my life in the third person.¹⁸²

We will come to loss of vitality and the third-person perspective in due course. Another patient reports the body as emptied out like a husk: there is ‘no inside of the body, but only a frame’. He says that when he eats ‘the food is falling in a vacuum ... Behind the chest is nothing, only a big hole.’¹⁸³ One of Bleuler’s patients exclaimed, ‘Body and soul don’t belong together; there’s no unity’.¹⁸⁴ What seems to be happening here is a diminishment, evisceration and alienation of the body in relation to the mind: the birth of Cartesian dualism, of which we are all the heirs. I will have more to say about this in Chapter 22, the chapter on the subject of time.

A tendency towards analysis is another cause of loss of the sense of the whole. The fact that fragmentation plays such a part in schizophrenia is philosophically significant: fragmentation is the drive behind an atomistic vision of the world, abstraction and disembodiment, and an untempered belief in analysis. As a patient of Sass’s put it: ‘Well, look at the word

analysis. That means to break apart. When it turns in upon itself, the mind would rip itself apart.’¹⁸⁵ The schizophrenic mind, in seeing everything, as the left hemisphere does, as a ‘show’ or representation is inevitably turned back on its own creations, working on itself, being denied access to the freshness of experience mediated intuitively by the body and its sensations. And patients with schizophrenia become excessively analytic in their approach to life, as we will see. It is a striking fact that the same self-referential, disembodied, non-intuitively grounded, representational world, the consequence of right hemisphere failure, is also the outcome of years of practised speculation by some analytical philosophers, as Paul Feyerabend reflected.¹⁸⁶

Loss of self

The effect of fragmentation and alienation from the body is to erode one’s identity. Sometimes the belief arises that one simply *is* ‘someone else’ – an extraordinary concept given that, however changed one might feel, it seems intuitively obvious that one can only be who one *is*, not someone else. ‘I am somehow strange to myself – I am not myself’, says Wolfgang Blankenburg’s schizophrenic patient, Anne.¹⁸⁷ Another says: ‘I am not able to feel myself at all.’¹⁸⁸ This is because the subject no longer has a self: in its place, a disembodied eye clinically inspecting the shell where the self should be.

Without a self, there is no capacity for intersubjectivity, for the experience of shared time in a shared world, and this is closely linked with the ‘freezing’ of reality, as we will see.¹⁸⁹ As Merleau-Ponty noted, ‘presence’ concerns *both* self *and* world: subject and object are just two abstract ‘moments’ within a unique structure – *presence*.¹⁹⁰ Sass comments:

‘Presence’ is so very general, and so very taken for granted, as to make any description sound empty or tautologous. Yet this dimension is of crucial importance in human existence; its absence or attenuation shows up in derealisation and depersonalisation experiences of various kinds, involving subjectivism and solipsism as well as deadening objectification. ¹⁹¹

Both subjectivism and solipsism, on the one hand, and morbid objectification on the other – but I will come to that – are equally found in schizophrenia: each is a breakdown of betweenness. ‘Self and other’, as distinct but not isolated, then, is a necessary dipole, necessary for there to be relation; and it is one that is collapsed in schizophrenia. Loss of self may be experienced in a number of ways: as loss of boundaries between the self and other; as the self breaking apart; as alteration in the form of the face or body; in a lack of the sense of ownership of the body and of its actions; as well as in an alienation of the self from empathic connexion with the world and with others, from which in normal circumstances the self draws its life. We are experiencing a rise in so-called dissociative disorders, such as borderline personality disorder, conditions in which the sense of one’s own identity is weakened or lost altogether. In the modern world the individual may experience himself or herself as no longer having a role and a place in a close-knit community on a human scale, and therefore as engulfed in the mass – of the populace, of the city, of bureaucratic organisations and global corporations – relatively powerless. No wonder people emphasise (with tragic and damaging results) something called ‘identity’, in which, ironically, their true identity is swallowed up.

In such a condition, there is no traction between self and world, or between self and other selves. Bin Kimura calls schizophrenia a disturbance of *das Zwischensein* (literally, ‘the being-between’).¹⁹² English lacks a term for it: it is what I have called ‘betweenness’. In schizophrenia, because of the lack of betweenness (without which the world is incomprehensible), boundaries are experienced where none should be, and where boundaries should be, none is experienced. These are two facets of the same thing: a loss of identity. In modernism, too, that sense of the self which can only come about when we are still embedded in the context of a shared world becomes eroded.

Eugen Bleuler, at the dawn of modern psychiatry, thought a defining feature of schizophrenia is that ‘the person loses his boundaries in time and space’.¹⁹³ For sufferers, boundaries sometimes liquefy in a terrifying meltdown of identity. The pieces of the world that should be shared – for example, emotions – are not, and those that should be private – for example, physical intimacies – are shared. The body is fused with others, and vulnerable, while the psyche is invulnerable and isolated. John Cutting

writes that what he has called ‘violability’ occurs in no less than one-third of schizophrenics:

- own eyes embedded in paper as he reads;
- friend’s body erupting through his body;
- others’ faces feed into him;
- other people’s bodies intermingle with hers. [194](#)

The Austrian psychiatrist, Paul Schilder, a pupil of Freud, reported a patient who felt that

when I am melting I have no hands. I go into a doorway in order not to be trampled on. Everything is flying away from me. In the doorway I can gather together the pieces of my body. It is as if something is thrown in me, bursts me asunder. Why do I divide myself in different pieces? I feel that I am without poise, that my personality is melting and that my ego disappears and that I do not exist anymore. Everything pulls me apart ... the skin is the only possible means of keeping the different pieces together. There is no connexion between the different parts of my body. [195](#)

And in James Chapman’s important 1966 paper on the phenomenology of schizophrenia, we find two patients:

When I look at somebody my own personality is in danger. I am undergoing a transformation and myself is beginning to disappear ...

I feel my body breaking up into bits. I get all mixed up so that I don’t know myself. I feel like more than one person when this happens. I’m falling apart into bits ... [196](#)

In schizophrenia the results are terrifying and extreme, but they can be seen as vivid metaphors of a disintegration of the boundaries between the private and public, between the embodied sense of the whole that must be

intuitively understood and the graphically explicit snapshots of fact and image in our contemporary world, in which there is an erosion of empathic connexion coupled with a promiscuous divulging, a devaluing of the personal. The confusion of identity is associated with the absence of two things, exemplified in these vignettes: permanence from moment to moment in *time*, and integration of parts in *space*. When there is no self, there can be no other; and when there is no other, there can be no self. What in the past gave us that stable ‘other’ was our culture, stretching in time back in the past and forwards into the future as part of a living tradition; ramifying laterally into kin and community, and the land out of which we came and in which we live. But once ‘anything goes’, nothing goes. There is no purchase between the individual and the world.

One patient complained that ‘increasingly I began to feel that I sort of fused with my surroundings’. ¹⁹⁷ Though there are elements in schizophrenic discourse that sometimes sound like a perhaps desired state of spiritual awakening, we should clearly distinguish them from more authentic-seeming moments of spiritual enlightenment. The quality of distress alone that is associated with them is indicative: spiritual enlightenment is invariably described in terms of a deep serenity. What they do illuminate, though, is precisely how important an intact sense of self is to the genuine experience of self-*transcendence*.¹⁹⁸

Both ‘the sense of an integrated self and the differentiation between the self and world’ depend on the integrity of the right temporoparietal region.¹⁹⁹ Activation of the right somatosensory cortex is associated with ‘a preservation of the sense of self’.²⁰⁰ The link between pathologies of the self and right hemisphere damage is striking. In John Cutting’s series of such phenomena following unilateral brain damage, he found breakdown of boundaries between self and other, just as in schizophrenia, in 11 cases: all 11 involved right-sided damage only. He also recorded a willingness to disown responsibility for one’s own actions or thoughts, which he calls ‘causal repudiation’: eight out of the nine cases were attributable to right hemisphere damage.²⁰¹ Such disowning of responsibility is another common finding in schizophrenia, and some would say in the ‘culture’ around us.²⁰²

Devitalisation

A patient of Minkowski's speaks (the italics are added to draw attention to changes that have obvious hemispheric implications):

Everything around me is *immobile*. Things present themselves in *isolation*, each on its own, *without evoking any response* in me. Certain things which should produce a *memory*, evoke a host of thoughts, present a *picture*, instead remain isolated. They are *understood rather than experienced*. It is as if a *pantomime* is being played out around me, one in which I cannot take part – I remain on the *outside* of it. My critical faculty remains, but I *lack any instinctive feel* for life. I can no longer manage to give enough *life* to anything I do. I can no longer shift between major and minor key, and yet no life is supposed to be spent in a single tonality. I've lost contact with all sorts of things. Any notion of the *value and complexity* of things has disappeared. There's *no flow* between me and the world: I can't abandon myself to it. All around me is completely and utterly *fixed*. I have even less room to manoeuvre with respect to the future than I have with the present or past. There is, inside me, a sort of *routine* which makes me quite incapable of imagining the future. The *creative power is abolished* in me. I see the future as a *repetition* of the past.²⁰³

Here are a host of interrelated points, which describe the plight of modern humanity as exemplified in the writings of modernism. Not only is there immobility, but things are fragmented, 'presenting themselves' in a disconnected way, each on its own: no betweenness. What's more, there is more specifically no flow 'between' things: between her and the world, where things 'evoke' no emotional response, where she can no longer 'abandon' herself to the world, a world she cannot join, and where she must remain 'outside'. Life becomes unreal, seeming like a 'pantomime'. It is routine and repetitive, always the same. All creativity is gone. Life is no longer experienced, which is the only way in which it can truly be understood (right hemisphere fashion), but 'understood', which is to say reduced to a conceptual object, a re-presentation (left hemisphere fashion) outside of time.

The sense of authenticity, of reality, is, or used to be, taken for granted by most of us – for that, too, is a casualty of our age: remember Minkowska

(and Minkowski) noting the ‘demand for proof’ in schizophrenia? That’s where we live now. When it is lost, sufferers describe a ‘sense of separation, unreality, or deadening’, which is ‘inherent in a stance or attitude of disengagement’;²⁰⁴ ‘a mental remoteness’ in the words of one patient.²⁰⁵

The natural givenness of experience makes what we call reality possible at all. Without it we become no longer the subject of experience, in the normal sense, but its object, experiencing our *experience*, as if at second-hand: confronting a re-presentation, no longer inhabiting a presence. The schizophrenic mind, like the left hemisphere, flattens reality into one single plane, placing the observing eye and what it observes on the same level: parallel phenomena within the world, rather than inseparable facets of the single experience of a living subject.

Daniel Schreber seemed to see within him a second mind’s eye, engaged in the act of contemplating his own consciousness or thoughts (a phenomenon commonly depicted in the paintings of schizophrenic subjects).²⁰⁶ For him, the once intuitively understood was forced out of its context and could be accessed at one remove only, and therefore rationalistically: in other words, completely *mis*-understood. ‘What happens in these experiences’, writes Sass, ‘is that the tacit becomes focal: there is a rendering explicit of the implicit, of what would normally lie unnoticed in the back-ground of experience.’²⁰⁷ And what should be intuitive becomes a matter of calculation.

The lived self is highly dependent on the right hemisphere: the first person perspective depends on the right parietal lobe.²⁰⁸ The objectified self is still supported by the left hemisphere, so it may be that the schizophrenic subject recognises that a form of self persists, but that he or she no longer *inhabits* it. A patient with schizophrenia says ‘my first personal life is lost and replaced by a third-person perspective’; he further explains that he constantly witnesses his own experiencing, at one remove.²⁰⁹

We met the third-person perspective in schizophrenia before. A common feature of auditory hallucinations in schizophrenia is that voices speak *about*, not *to*, the self, using the third person: not ‘you are just a machine’, but, discussing among themselves, ‘he is just a machine’. Schizoid and schizophrenic persons tend to drop the first person in favour of a more impersonal language (‘the thought occurred that’) – similar to the way we are taught to write scientific reports – and, according to Bleuler, ‘schizophrenics can write whole autobiographies without manifesting the

least bit of emotion. They will discuss their sufferings and their actions as if it were a theme in physics.’²¹⁰ When a patient of Minkowski’s was asked to write about his life ‘characteristically, he only mentioned objects, walls, boxes, bolts, and bolt-holes; not one living person entered his description. One would say that his whole life was made up of solid and immovable objects.’²¹¹

Disengagement makes us objectify what we see, including ourselves and our own bodies. As Cutting puts it, following a distinction made by Sartre and Merleau-Ponty, the body ‘is both *en-soi* – a thing-like object to me when I look at it when *still*, and to you when you look at me when *still* – but also *pour-soi*, my agent when I use it for me, and for you when you see me *carry out an action*.’²¹² The tendency to stasis denatures, and renders inanimate: thus in both right hemisphere damage and schizophrenia, the body is an object in the world alongside other objects, not the very medium of experiencing the world.²¹³ Human beings, their minds, their brains, their bodies and the world, all become *things* in schizophrenia. So, write Stanghellini and colleagues,

there is an increased degree of ‘thingness’ in the body. Parts of oneself are spatialised, as if they were not part of the living body. Also, the body is experienced as devoid of life or substituted by some kind of mechanism. A typical sentence is: ‘She felt programmed like a robot’ ... In general, the body or its parts are experienced as mere thing-like entities, rather than as living flesh ... as if they were dis-integrated from the living totality of one’s body.’²¹⁴

These things or objects are, however, not specific and concrete, but general and abstract. They are no longer unique, but representatives of a class. Classes, categories take over from real people and real things. For one of Minkowska’s patients, objects merged and seemed alike – similarity became the one and only point of view under which they could be regarded. Their individual nature had been wiped out.²¹⁵ Minkowski reports another patient for whom people were no longer seen as individuals but only ‘schematic mannequins’.²¹⁶

This is the bureaucratic perspective: abstract, grossly simplified, dealing in categories, reducing life to puppetry. And it is often expressed using nouns in preference to verbs, and abstract nouns in preference to concrete ones.

The talk of schizophrenic subjects tends to have an excessively abstract, excessively general, quality (which is aptly known to psychiatrists as ‘pseudo-philosophical’).²¹⁷ Beyond that, they tend to use language that lays emphasis on the static aspects of experience at the expense of the dynamic and emotional, thereby evoking a universe more dominated by objects than by processes or actions. This natural inclination to immobility is embedded in schizophrenic speech, which is characterised by an excess of adjectives (thing-describers) and a dearth of adverbs (process-describers).²¹⁸ And to the extent that schizophrenics use adverbs they tend to prefer spatial adverbs to temporal ones (for example, ‘where’ may replace ‘when’).²¹⁹

Incidentally, aspects of such a linguistic shift can be seen in the poetry of Friedrich Hölderlin, who developed schizophrenia in his middle years. After the onset of his illness he cut out the word ‘I’; and, according to his editor Friedrich Beißner, ‘never depicts a unique instance in its particularity, but only ever sees the *type*’. He cleaved to an eternal present, in which all became generalised.²²⁰ His language came to incorporate an abundance of purely conceptual abstract nouns hitherto unknown in his poetry, such as ‘view’, ‘sublimity’, ‘apparition’, ‘spirituality’, ‘friendliness’, ‘inwardness’, ‘humanity’, ‘pastness’, and ‘familiarity’.²²¹

As Sass observes, ‘we typically find that, while schizophrenics sometimes manifest seemingly literal or concretistic thinking, they are also given to unusually *abstract* modes of cognition’.²²² That may seem odd, but let me explain.

In acute schizophrenic discourse, there is a tendency for responses to lose ‘connection to their referent’, and become lost in ‘a bewildering variety of *intraverbal* associations’.²²³ (This is reminiscent of modern money markets in which money displaces the lived reality which alone gives it meaning, and appears to take on a ‘life’ of its own, undergoing a myriad transactions with itself.) As the referential links to the situation become obviously less and less adequate, the productions do not show signs of halting, but instead are redoubled.²²⁴ (In right hemisphere damage there is often logorrhoea – a meaningless hypertrophy of language.)²²⁵ Searching

for what accounts for the strangeness of schizophrenia, Freud noted that ‘we eventually come to realise that it is the predominance of what has to do with words over what has to do with things.’²²⁶

Freud’s use of the word ‘things’ there may seem to contradict what I have just been at pains to explain about ‘thingness’ in schizophrenia. Unfortunately, in English we do not distinguish between two almost opposite senses of the word ‘thing’: (1) an inanimate object (*Gegenstand*) by contrast with a living entity; and (2) a thing as an object or matter of concern to one, tangible or intangible (*Sache*) – one’s ‘stuff’, if you like – by contrast with a purely abstract concept. Freud’s word for ‘what has to do with things’ here is *Sachbeziehung*, his point being that schizophrenics prefer abstractions to the life those abstractions represent.²²⁷ Indeed, excessive abstraction has been described as ‘probably at the source of cognitive deficit in schizophrenia’²²⁸ – living in the map, not the world: words that refer only to other words; abstractions that become more real than actualities; symbols that usurp the power of what they symbolise: the triumph of theory over embodied experience. I believe there are resonances here with academic trends in the humanities, with scientism, and even with the world-picture of the average Western citizen.

The common factor in these is an aversion to life; we come to prefer either inanimate objects or words – both left hemisphere predilections. As Cutting formulates it, ‘the schizophrenic self is concerned with universal essences, not particular things or persons ... with names and signs, signifiers detached from what they signify, and ... talks like a philosopher’. (Arthur Tatossian thought the cast of mind exhibited by Husserl in *Ideas I* ‘indistinguishable from the schizophrenic’s actual *modus vivendi*’.)²²⁹ Interestingly, Freud himself commented more than once on the relationship between schizophrenic thought and a tendency in philosophy – ‘a paranoid delusion [is] a caricature of a philosophic system’²³⁰ – a point worth noting, as I shall return to the topic in Part II:

When we think in abstractions there is a danger that we may neglect the relations of words to unconscious thing-presentations, and it must be confessed that the expression and content of our philosophizing then begins to acquire an unwelcome resemblance to the mode of operation of schizophrenics. We may, on the other hand,

attempt a characterisation of the schizophrenic's mode of thought by saying that he treats concrete things as though they were abstract.²³¹

If your world disintegrates, you stop seeing anything in context, and it becomes puzzling, even frightening. Its sheer facticity then stands out, since it can no longer take its place in any world schema of other things and people that would give it meaning. Renée, a highly articulate young woman with schizophrenia, describes how when, for example, she looked at a chair or a jug, she no longer saw it as situated in the world as something to sit on or something to hold liquid, but standing forth as under a spotlight:

things looked smooth as metal, so cut off, so detached from each other, so illuminated and tense that they filled me with terror ... In the silence and immensity, each object was cut off by a knife, detached in the emptiness, in the boundlessness, spaced off from other things.²³²

It is no longer *eine Sache*, but become essentially *ein Gegenstand*. In Heidegger's terms, these familiar objects are no longer *zuhanden*, embedded in the world and implicit, but stand forth as *vorhanden*, isolated and explicit, a consequence of the left hemisphere's focussed self-conscious attention, whose harsh spotlight denatures what it 'illuminates'. Her description makes them sound as if they formed part of a de Chirico painting. Or were Platonic forms.

Tatossian described hallucinations as aperspectival, complete and essential – in the Platonic sense – not like normal perception, which is necessarily incomplete and particular. And he links this with the absence of a real perceiving subject: 'in its *essence*' (and the emphasis is his)

perception is incomplete: for that reason, it is an action, an effort, even if that effort is not 'felt' psychologically; and this implies ... the perceiving subject.²³³

Since such a subject no longer exists for the schizophrenic, his view becomes a view from nowhere.²³⁴ 'Madness', wrote Roland Kuhn, '... fails in the attempt to achieve a finite, a truly temporal, perspective on one's

existence.’²³⁵ Sass comments that in schizophrenia there is ‘the sheer sense that this event is in certain respects a copy of some prototype ... like some Platonic or noumenal essence, lying behind the merely phenomenal world one directly experiences’.²³⁶ As Cutting says, the patient talks like a philosopher (or some philosophers talk like patients): both draw excessively on the left hemisphere mode of being in the world.

Concrete instances are always unique; only an abstraction can be general. The abstractions, for which the left hemisphere has an affinity, are derived from the unique incarnate cases taken in by the right hemisphere, and are therefore *secondary* to them. Yet from the left hemisphere’s own viewpoint, not having insight into what the right hemisphere knows, the situation appears reversed, and abstractions come to appear, in Platonic fashion, *more real than the real-world instances from which they are derived*. Thus the dramatist Antonin Artaud, who suffered from schizophrenia, remarked: ‘I go from the abstract to the concrete and not from the concrete toward the abstract.’²³⁷

Effectively the schizophrenic subject becomes like the scientist: no longer intuitively inhabiting a body and an embodied world, as it were from the inside, but inspecting it, as if an alien *thing*, from the outside. As Cutting writes:

If human experience is rated on an axis of ‘thingness’ at one end and ‘myiness’ at the other, then schizophrenics fall beyond normal subjects at the ‘thingness’ end and depressives fall beyond normal subjects at the ‘myiness’ end.²³⁸

A schizophrenic patient says ‘it is as if I am an outsider’.²³⁹ Objectification is reciprocally related to a sense of alienation from the world at large: objectifying alienates, alienation objectifies. Observing one’s life, as a scientist might, from the outside, causes reality to change utterly. The body *pour soi* is replaced by the body *en soi*: *der Leib*, the lived body – the body one *is* – gets replaced by a deanimated anatomical entity, *der Körper*, the corpse, the body one *has*.²⁴⁰ These tendencies lead us to live in a world in which abstractions are more real than whatever it is they represent, in which the individual being is swallowed up in a category, in which words become more important than acts or facts, and in which the

living is turned into something inanimate. Reader, do you recognise this world?

‘Once I was a man’, said one patient, ‘with a soul and a living body [*Leib*]’,

and now I am no more than a being [*Wesen*] ... Now there is nothing left but a corpse [*Körper*] and the soul is dead ... I hear and see, but I know nothing any more, for me life is now a problem ... I live on now in *eternity* ... the branches on the trees sway, other people come and go in the room, but for me *time no longer flows* ... Thought has changed, there’s no more style ... What is the future? It can’t be reached ... All is a question mark ... Everything is so *monotonous*, morning, noon, evening, past, present, future. Everything *keeps starting all over again*.’²⁴¹

Whitehead saw that ‘there is no such thing as life “at one instant”’.²⁴² Substitution of instants for the vital flow causes life to drain away. Minkowski called this ‘loss of vital contact with reality’, and associated it with the loss of the sense of flow.²⁴³ For the normal person, he maintained, the world is not just an assemblage of external stimuli, atoms, forces and energy, but ‘*a moving stream which envelops us at all points* and constitutes the milieu without which we would not know how to live.’²⁴⁴ ‘All of this’, he wrote,

leads one to surmise, at the very least, that this vital contact with reality is bound up with the secret dynamic force of our life. The rigid concepts of our spatial thought can’t get near it. Metaphors are far more to the point here than definitions. Only they can impart some clarity to the notion of vital contact with reality.²⁴⁵

The schizophrenic subject, for whom this is lost, is ‘attacked in his vital dynamism’: he ‘can only *juxtapose*.’ His thoughts are ‘immobile as statues’. Travelling by train, he will complain that the world goes past too fast for him to find the static moments with which to ‘solder together mentally the infinite number of points’ into which thought had sundered movement.²⁴⁶

This is an exact expression of the way the left hemisphere has mechanically to reconstruct what in the right hemisphere is a living and indivisible flow. It is an attempt in vain to breathe life into a corpse.

As schizophrenic patients exhibit emotional indifference, passivity and inertia, so do right hemisphere-damaged patients.²⁴⁷ We have seen that the left hemisphere has an affinity for the inanimate, and that in right hemisphere damage, body parts on the left may become exaggeratedly thing-like: it is hard to forget the patient of Ehrenwald's, for whom the left side of the body was replaced by a contraption of planks and shelving.

Similarly, in schizophrenia, a patient may complain of 'a feeling that his own existence was as of a dispensable object, as if he was a thing, a refrigerator, and not a human subject.'²⁴⁸ Cutting quotes examples of subjects saying they have a machine in their ear, pieces of metal in their legs, or a bag of petrol in their body. Tatossian described in detail the case of a patient, Hélène Jacob, almost unsurpassed for its detail, and I will draw on it later in the chapter: when Hélène speaks of trying to mend herself, the word she uses is not *se guérir*, to heal, but *se reconstruire*, to reconstruct herself. She was just a few steps ahead of us, we who are taught that we are just machines; that the lights are on, but no-one is at home.

I mentioned that it has been my clinical observation over the years that schizophrenics are far more likely than other patients to refer to their 'brain'. The mind, a process in time, becomes the brain; but the brain, too, is no longer processual – rather it is seen as a hollow thing, containing other things. 'My brain has become a sort of box for thoughts', comments one schizophrenic patient.²⁴⁹ Human beings – their minds, their brains, their bodies and the world – all become *things* in schizophrenia. One schizophrenic patient pronounces: 'people should take inanimate matter as a model in order to constitute their firmness and the rationality of their movements.'²⁵⁰

Bergson thought that what he called 'intuition' (RH) was modelled along the same lines as life itself; what he called 'intelligence' (LH), on the other hand, was characterised by a complete lack of understanding of life. Similarly, 'right-hemisphere-damaged subjects tend to experience a lack of life-like qualities', writes Cutting, 'whereas left-hemisphere-damaged subjects experience the exact opposite.'²⁵¹ (We have already seen this vividly demonstrated in Chapter 2.) A Swiss writer, Robert Walser, who later developed schizophrenia, thought that Cézanne must have

looked upon his wife as if she were a fruit on the tablecloth. For him the outlines, the contours of his wife were exactly the same simple but also complicated ones as he'll have seen around flowers, glasses, dishes, knives, forks, tablecloths, fruits, and coffeepots and cups.²⁵²

True self-transcendence makes one come alive; but the loss of self that is consequent on the failure of integration across time makes subjects with schizophrenia see themselves as devitalised or dead. Minkowski's insight into the core of schizophrenia was that it is a 'loss of vital contact with reality'.²⁵³ A patient of Bleuler's was 'dead and yet living'.²⁵⁴ Here are a number of patients of Jaspers:

I am only an automaton, a machine; it is not I who senses, speaks, eats, suffers, sleeps; I exist no longer; I do not exist, I am dead; I feel I am absolutely nothing ... I am not alive, I cannot move; I have no mind, and no feelings; I have never existed, people only thought I did.²⁵⁵

One describes himself 'as if I were living in a graveyard'.²⁵⁶ Antonin Artaud described the severing of 'vital ties', 'a great cold, an excruciating abstinence' or 'living death'; he lamented a 'dispossession' of 'vital substance', an 'ebbing of my soul', associated with 'disorganisation' and 'constant leakage of the normal level of reality'.²⁵⁷ Disorganisation: *organisation* is the essential nature of an *organism*, which does not piece together, but grows its *organs*. Once there are no coherent enduring entities over time, reality ebbs away. This is a common trope in modernism, and is reflected in scientism and other reductionist philosophies. 'I walk like a machine', says one patient;²⁵⁸ 'I'm a psycho-machine', says another.²⁵⁹

Equally common is seeing others as not alive. Some examples gathered by John Cutting include:

on the underground all I could see were people in a car and they looked like ghosts, statues, monuments, dead people, as if cremated; people looked dead, pale, cold.²⁶⁰

One patient connects this deadness, this inanimacy with lack of embodied instinctual drive, the *élan vital*:

Everything around me is as if dead, like uninhabitable houses: I don't mean ruins, for they have a sort of poetry. No, I am insensible to all that. I do everything out of obligation. I eat with effort, for material life does not interest me. I pretend to love, I make the gestures, but I feel none of it. At times I'd be glad to be like others, but that cannot be. The world leaves me cold. Men are 'automated corpses' – my mother a gluttonous doll.²⁶¹

'We created everybody in a secret lab', claims a patient reported by Stanghellini, as though humans were robots.²⁶² As one patient puts it, 'everyone seemed to be walking around like zombies ... a cross between robots and people.'²⁶³ Hélène Jacob reported that people were putting on an act, and were no more than robots.²⁶⁴ Another reported that staff with which she was familiar had been 'replaced by dummies'.²⁶⁵ According to another subject, people look 'like toys'.²⁶⁶ The flip between *seeing* the dead and the devitalised, and *being* dead or devitalised is exemplified by a patient reported by Rachel Rosser: 'Perhaps my nervous tissue has been destroyed ... I used to think everyone else was an automaton. Then I saw them relating to one another and I realized I was the automaton.'²⁶⁷

In schizophrenia, because of the lack of distinction between the living, the dead and the never-alive, while living beings become disturbingly like zombies or machines, inanimate things can on occasion become disturbingly alive. (Worth remembering as we monitor our progress into twenty-first century 'Enlightenment'.) The patient Renée, commenting on what happens when objects have 'lost their names, their functions and meanings', notes that 'they became "things" and began to take on life, to exist'.²⁶⁸ But their life is terrible, predatory. She later records that 'I implored [my mother] to save me from the clutches of the Enlightenment and the animation of Things.'²⁶⁹

'Intelligence', writes Minkowski, referring again to the philosophy of Bergson, in which 'intelligence' means effectively the left hemisphere's grasp,

although it is the product of nature, has as its principal object inorganic matter. It can only reflect things which are discontinuous and immobile. It only feels at home when dealing with *dead* things.

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The counterparts of this, too, can be clearly seen in early modernism. According to Wyndham Lewis, '*deadness* is the first condition of art ... as opposed to naked pulsing and moving of the soft inside of life, along with infinite elasticity and consciousness of movement, on the other ... The second is absence of *soul*, in the sentimental human sense ... It has no inside.'

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Schizophrenic subjects also often complain that they have lost touch with their feelings or even with their body altogether: 'in general, I didn't have a sense of my body anymore; this completely vanished at some time.'

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So Anne reported plaintively that 'all that is left to me is to rely on reasoning'.

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She represents the model human being of cognitivist psychology – something very like *homo economicus*.

Man the machine

Morbid objectivisation of the body leads not just to devitalisation but to seeing it as specifically *mechanical*. A patient of Franz Fischer's complained that 'I am like a machine that runs standing still on the spot. It's being run almost to breaking point, but it stays just where it is.'

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And again we see here the lack of traction between self and the world: the 'machine runs' at breakneck speed, but there is no movement in the subject's world (reminding one of Alice and the Red Queen).

Below is a picture entitled '*Corps humain*', the human body, drawn by a subject with schizophrenia, from which the head appears to be missing, though a tiny 'brain gland' (*Gehirndrüse*) and 'brow cavity' (*Stirnhöhle*) are indicated in amongst the various pipes and ducts:

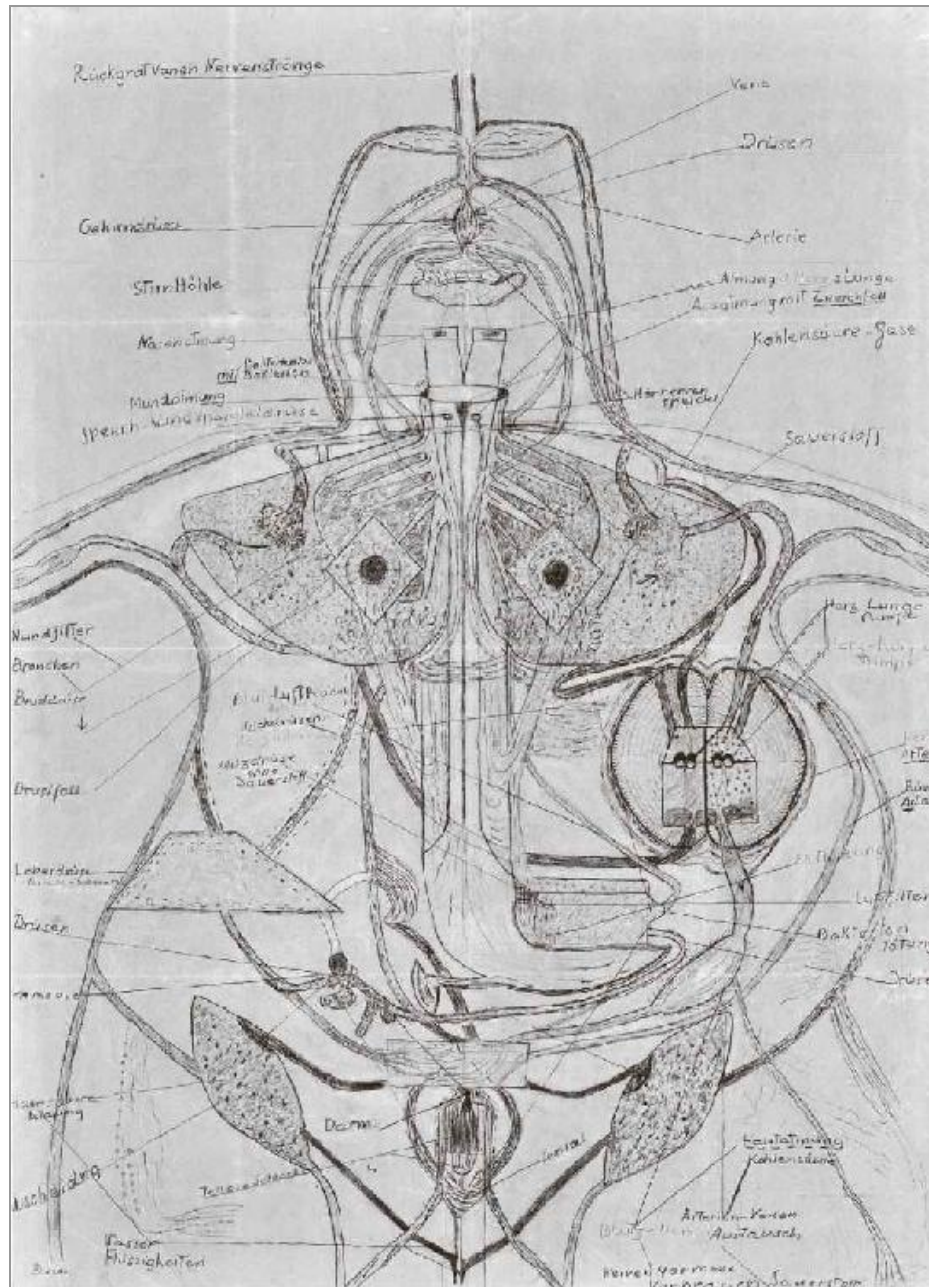


Fig. 25. 'Katharina', Corps Humain (1965). Drawing of a human body, by a schizophrenic subject, showing internal organs and apparently without a head (Photo: Marie Humair, Atelier de numérisation – ville de Lausanne. Collection de l'Art Brut, Lausanne)

Minkowski had a patient who, as well as believing that sex could be reduced to mathematics also believed 'the human soul to be the result of an action of acids on the brain'.²⁷⁵ Sass describes a patient who spoke of himself becoming a 'more efficient communications machine'.²⁷⁶ If these

remarks from schizophrenic patients seem oddly familiar, it may be because this pathology is now embedded in the culture that surrounds us.

It is very common for people with schizophrenia to describe themselves as machines or computers, or as being controlled by forces emanating from machines or computers – so common that, in my experience, if the right questions are asked it can be found in at least half of all such patients. Sass had a patient who felt his mind was a ‘photocopy machine’.²⁷⁷ Many patients report believing themselves to be cameras, computers or other mechanical devices: ‘I saw everything I did like a film camera’;²⁷⁸ ‘I was myself a camera’.²⁷⁹ Another patient says that

no matter where, the observing was with everything I did ... For me it was as if my eyes were cameras, and my brain would still be in my body, but somehow as if my head were enormous, the size of a universe, and I was in the far back and the cameras were at the very front ... all is like a machine.²⁸⁰

A patient of Sass’s complains that ‘there’s nothing there, no cognition at all. I’m actually deluding myself into thinking I could think ... I was actually searching my memory bank ... non-mechanical thinking? I can’t conceive of that any more.’²⁸¹

The borderline between persons and computers is here, for such minds, fascinatingly blurred. At the same time schizophrenic subjects will doubt that anything exists apart from what they conceive in the hall of mirrors of their own mind. Parallels with both these positions, once again, from historical and, especially, contemporary philosophers, and cognitive scientists, hardly need to be laboured (‘deluding myself into thinking I could think’ neatly expresses the illogicality of one such position). For such patients, as for certain scientists and philosophers, the human being itself is reduced to a mechanism: thus according to one schizophrenic subject ‘man is merely a heap of memories in a standard hardware’;²⁸² to another ‘everyone is talking to each other and I can’t figure out the mechanism ... One day the day will come and we’ll see that it’s all quite mathematical.’²⁸³

While there are cognitivist scientists to whom that would seem to make perfect sense, and for whom it would even be a welcome advance, I doubt this means that schizophrenics are seers and philosophers with privileged

insight into the nature of being, any more than that they are spiritual masters; but that, more probably, there is something very odd that happens to the world once you view it in the way towards which our unbalanced analytic tradition in philosophy and our unbalanced technological tradition in science leads us, a tradition in which most academics now are so thoroughly schooled that they can't see that there is a problem, let alone how to escape it.

'The clock, as we have already mentioned, was not just a clock but an assemblage of instruments of torture – cogs, key, hands, pendulum, etc. *Every object that he saw was like a clock.*'²⁸⁴ So writes Minkowski of one of his patients. This was the fashionable Enlightenment view exemplified by de La Mettrie's *L'homme machine*, one which carries on effectively unaltered in the minds of many biologists. (It was also Paley's view of God: the watchmaker and his clockwork universe.) Once the body is foregrounded by the left hemisphere as a thing alongside other things to be observed and 'understood', as a scientist might observe a specimen, from without, it can no longer act as the intuitive, unquestioned and *continuous* basis of understanding itself.

In schizophrenia, subjects say that they find themselves, like scientists, 'not involved in the world, merely observing it from outside to understand its secret workings'; one finds himself 'a detached onlooker'; another reports that 'I am like an anthropologist.'²⁸⁵ Blankenburg's schizophrenic patient Anne complained bitterly that for her it was 'as if I examine the whole world-mechanism from the outside.'²⁸⁶ Descartes had aspired 'to be a spectator rather than an actor in all the comedies the world displays'.²⁸⁷ As Minkowska aptly remarks of schizophrenic subjects, 'they sit by like spectators on the life that plays itself out around them; they neither act nor feel'.²⁸⁸

As machines we are manipulated by others, by robot-makers, or puppet-masters (or nowadays 'selfish genes'). Hélène saw the living world as 'aspiring' to be a puppet theatre.²⁸⁹ Another woman with schizophrenia described other people as seeming 'so phony and lifeless and small, as if they could be manipulated in her fingers', and wondered whether they could be drawings, or perhaps marionettes, robots, or automatons.²⁹⁰ The patient Renée described other people similarly: 'around me, the other children, heads bent over their work, were robots or puppets, moved by an invisible

mechanism’.²⁹¹ A patient of Schilder’s reported: ‘I am quite mechanical. I have gone to pieces. I am like a marionette’ (see Plate 10[a]).²⁹²

As people become more like machines, machines become more like people – both in the modern world and in schizophrenia. Schizophrenic individuals often seem to inhabit the ‘uncanny valley’ – a term that virtual reality and video game designers use to refer to that unsettling, liminal realm in which one is uncertain whether something or someone is alive or dead, real or unreal.²⁹³ And machines produce their own version of time: ‘my head has become a clock, a machine, now I’m making time myself ... the new time is ... produced by the ... machine’.²⁹⁴

Bearing in mind the analytic tendency of the left hemisphere to pare the body down, in Zwicky’s phrase to ‘polished bone’, and given the way in which the left hemisphere offers a map in place of the terrain that is mapped, a patient treated by Minkowska is highly informative:

What upsets me a lot is that I have a tendency to see only the skeleton in things; it can happen that I see people in this way. It is like geography, where rivers and cities are lines and points ... I schematise everything, I see people as points or circles. When I think of a meeting I attended, I see the room, I represent the people present by points.’²⁹⁵

Living in a diagrammatic version of reality leads to seeing, in Eliot’s phrase, ‘the skull beneath the skin’.²⁹⁶ The psychoanalyst Eric Laurent describes a psychotic patient who ‘would see a skull on the face of the girl he was interested in, and his own skeleton through his skin during sex’.²⁹⁷ Again Hélène Jacob believed she was

an entirely transparent woman. (For this reason I have been contacted by today’s scientists, who are able to record every movement made by the circulation of my blood – my heart – lungs – bladder – guts.) ... All human bodily reactions, whether spontaneous or induced, can be reproduced as a diagram like an administrative map of the human body.²⁹⁸

The painter Edvard Munch, who was hospitalised for a paranoid psychotic illness, painted a self-portrait with his arm replaced by a skeleton (see Plate 10[b]). As readers would expect, it is the *left* arm; as it was when William Kurelek, a patient treated for schizophrenia at the Maudsley Hospital, represented his younger self in a detail of the astonishing painting of his psyche, *The Maze* (see Plate 11).

Against nature

The counterpart of a predilection for the mechanical is an alienation from – an aversion, even, to – whatever is *natural*.²⁹⁹ ‘I lost all sense of naturalness’, says one schizophrenic subject. ‘I can induce it or not with my own brain.’³⁰⁰ In parallel, the three-dimensional is replaced by the two-dimensional, the living by the mechanical and the natural by the artificial.

There is a positive distaste for what is natural and spontaneous (the right hemisphere’s realm), and an exaggerated concern with *utility* and the man-made (the left hemisphere’s realm). For Hélène Jacob, according to Tatossian, if places are not useful for something they are empty wastelands: she called them the ‘Africas’ of the whole world:

For Hélène, nature is Nothing, since she places herself irrevocably outside the world, which is experienced as exclusively ‘a complex network of tools’. Not in a single passage of her memoir, not even in its more lyrical flights, does Nature appear: Hélène has no ‘feeling for nature’ and this absence has existential meaning, not purely literary significance. Hélène’s favourite spaces are those of towns; or better, these are the only places ‘she can take seriously’.³⁰¹

Tatossian points out that towns alone are ‘good for’ something; providing housing, workplaces, welcoming tourists, facilitating trade:

in a word, they have a function, a ‘utility’, and by the same token render their inhabitants ‘tools’, good-for [something or other] ... nature, nature is useless and man feels himself useless in her presence.

She had plans to make everything, including the sea, *useful*, if necessary through tourism (her attitude is an uncanny anticipation of that of rural ‘development’ boards). Her world plan is the progressive extension of towns into the natural world, affirming “tool-being” [*l’être-outil*].’³⁰² In schizophrenia, as in modernity, there is a relentless antagonism towards nature – both in humanity and in the whole natural world.

According to Maurice Dide and Paul Guiraud, schizophrenia

is characterised from the outset, at an early age, by a collapse of the instinctual origins of mental life ... A weakening of the vital spirit and of emotional capacity is both the necessary and sufficient element by which we may characterise the illness.³⁰³

To my mind, all that we have looked at here approximates the bizarre, alienated condition enjoined on us today and reinforced by a toxic combination of bureaucratic and scientistic (not necessarily scientific) thinking with that of the philosophers and pseudo-philosophers of the School of Nothing Buttery: all tending to the view that we are machines. Nietzsche bemoaned the state of normal human beings, those semi-animals unhinged from instinct and no longer able to ‘count on the guidance of their unconscious drives’, being forced instead ‘to think, deduce, calculate, weigh cause and effect – unhappy people, reduced to their weakest, most fallible organ, their consciousness!’³⁰⁴ Nietzsche is describing the loss of intuition, or the right hemisphere’s take, which is wholly inadequately replaced by that of the left hemisphere. The schizophrenic is the apotheosis of this tendency in modern man: Nietzsche’s prototype of ‘theoretical man’ and his ‘determination to destroy myth’.³⁰⁵ Myth is otherwise known as the deep, embodied, imaginative understanding available to the right hemisphere – and seen by the left hemisphere as a lie.

Hyper-rationalism

When the natural flow of time has become stilted or stopped, and the intuitive sense of the whole disrupted, the only way in which things can be put together again is by lining them up according to the linear chains of logic. We saw that one schizophrenic patient thought that ‘people should

take inanimate matter as a model in order to constitute their firmness and the *rationality* of their movements.’³⁰⁶ Another says ‘everything I do, I do with logic and reconsideration ... Almost nothing works naturally, of its own accord ...’³⁰⁷ Kretschmer described the schizoid temperament as having ‘a certain tenacious characteristic, a tendency to the enumeration of names and figures, to numbering, and schematisation, to logical abstraction, and to the building of a system at all costs.’³⁰⁸

It is widely accepted that the autistic brain tends to excessive systematisation. This then leads to the substitution of rules and procedures for the intuitive, engaged, intersubjective understanding of the world that is no longer available: human affairs are seen as guided by specific rules, rigid principles and schemas – schemas that are insensitive, like bureaucratic procedures, to human meaning. Importantly, logic is entirely structural: it is utterly impervious to content. Ludwig Binswanger reports the case of a father who placed a coffin under the Christmas tree for his daughter, who was dying of cancer, because the coffin was, he correctly reasoned, something she was going to find useful – thus a very suitable present.³⁰⁹

Flow is what makes sense of life. When it disappears all that is left is the disembodied forms of logic. As Blankenburg commented, *logic*, in schizophrenic subjects, has to substitute for narrative as a way of linking things together. He finds this already apparent in his patients’ school exercises:

The patients still manage to solve difficult, intellectually demanding tasks without considerable effort. These are tasks, however, that do not require much interpretive skill. In this early stage, some patients retreat to the study of mathematics and physics. They try to replace the ‘natural successiveness or consistency’ of experience that rests on common sense with what are sometimes more – and sometimes less – ingenious logical constructions.³¹⁰

The Swiss psychiatrist Roland Kuhn reported on the case of a patient with schizophrenia called Franz Weber, who ‘wanted activity of any sort to be replaced by knowledge’. Thus motion in the physical world would be replaced by stasis and abstraction. It seems that he ‘disapproved of a life that neither here nor anywhere could be *defined*’:

The motivating direction of the patient's entire work was to take the ready-to-hand [*zuhanden*, embedded and implicit] stuff around him out of its fluid situation in the business of living, and turn it into something that was purely present-to-hand [*vorhanden*, static and explicit].³¹¹

He developed the idea that he must collect and store all the knowledge that had accrued to human beings over the millennia to save it from destruction: a recording project (I will come to this shortly). What struck Kuhn was that his patient devoted enormous energy to describing the structures and procedures involved – the architectural and administrative detail – but nothing whatever was said about the content: 'Franz Weber was not at all concerned with what his [researchers] wrote and illustrated in their annually published books', provided they 'get ready one book each year, complete with tables and figures, which, he specified, should be of a high artistic standard'. All this is familiar to any modern academic, and indeed must be familiar to anyone alive today in the West or the urban East. It is all consonant with an emphasis on the left hemisphere's take on the world: the triumph of procedure over meaning in every walk of life.

Another schizophrenic patient attempted to understand how to interact socially by scrutinising the details of other people's behaviour, as if he were some kind of technical observer, perhaps an anthropologist; he wanted to encode the steps involved in making friends and to devise 'new schemata' for relationships on his hospital ward.³¹² Other subjects speak of understanding from the outside like a scientist, attempting to make sense of others' mental states through observing everyday 'transactions', or 'scientific' analysis of the workings of 'intelligent mechanisms' ('I study people. I want to understand how they are inside ... I studied a system to intervene at the right moment in conversations').³¹³

The problem in schizophrenia is not a failure of logic, but the exact opposite: a hypertrophy of the logical faculty, with the loss of some crucial aspect of life, expressible as the common sense elements that are immediately comprehensible to a normal person. Blankenburg speaks of a 'loss of natural self-evidence'; Sass of the 'loss of ipseity', the naturally given 'core sense of existing as a vital and self-identical source of awareness and agency.'³¹⁴ One schizophrenic patient told Blankenburg that

‘I am lacking something very ordinary but important and common to all human beings, and I cannot even say what it is like.’ ³¹⁵ In a revealing survey of schizophrenic subjects, about a third endorsed the statement ‘what is most essential in humans is not working in me’. ³¹⁶ In all forms of dialogue today – everything from a conversation with an office employee to a debate with a politician – I feel these words find an application: in fact it often feels as if one is talking to a machine.

There is a deep connexion between excessively rationalistic thinking and delusion. I have quoted Louis Sass’s observation that the most deluded patients are the most logical. Delusion-prone individuals who are not formally mentally ill also jump to conclusions faster, but then jump the other way too fast, as well, in the light of disconfirmatory evidence. It is as if they had ‘a need for closure’, and could not tolerate ambiguity and uncertainty. ³¹⁷ Another way of thinking about the situation is that they have only the most tenuous grasp on reality; but that must inevitably go with not tolerating ambiguity and uncertainty. Either way, it suggests a failure of the right hemisphere’s grounding role in a world where nothing is certain.

There is an insistence on mathematical or numerical aspects of the world, a striving after illusory certainty, a ‘morbid geometrism’, a preoccupation with spatial arrangements in the world, and with symmetry, corresponding to a certain ‘lifeless rigid obsessionality’. ³¹⁸ Minkowski gives an account of a patient whose attitude is alarmingly close to the ambitions of some scientists, analytic philosophers and bureaucrats, representing a free-wheeling left hemisphere. ‘As far as I am concerned, a plan is everything in life’, the patient tells us:

I wouldn’t upset my plan for anything, I’d rather upset life than the plan. It’s a feeling for symmetry, for regularity which makes my plan so attractive. Life displays neither regularity nor symmetry, and that’s why I *fabricate* reality. All my strengths I put down to my brain.

What I am going to say will appear fantastic, but there it is. My state of mind now consists in trusting nothing but *theory*. I can believe in something’s existence only when I have *demonstrated* it. For example, a

woman's body produces an effect on a man. Why? There's an example of something that I doubt, because I can't succeed in demonstrating it. I can't see myself trusting only to my impressions.³¹⁹

Sometimes, after seeing a woman in the street that made an impression on him, he would go home and sit down, in a maximally symmetrical posture, and try to reduce the problem to mathematics. Thus even sexual feelings might one day, he hoped, be abstractly codified and accounted for – though he found the problem prodigiously difficult because his analysis soon entered into an infinite regression. He felt sure that the body could be reduced to geometry, and that therefore – a sphere being the perfect shape – it was clear that the perfect shape to which the human body might aspire was that of a sphere.

In the world of the schizophrenic subject, mathematical criteria are applied to determine the value of objects and events – again, not unlike the mindset of modern bureaucrats – solely in terms of their measurable dimensions or geometrical characteristics. 'My intellectual parts became the whole of me', says one man with schizophrenia.³²⁰ Bergson's 'intellect', the left hemisphere, goes it alone; and it does not understand life. Blankenburg's Anne reported that 'it is impossible for me to stop myself from thinking';³²¹ as Sass and Parnas point out, 'her constant need to think was, however, accompanied by a constant inability to understand.'³²²

Blankenburg describes such patients as experiencing an impoverishment of all vital relationships apart from the reflexive relationship to oneself.³²³ And that too is impaired at times. Another schizophrenic subject reports that

apart from my reason, which is intact, everything else is in complete disarray. I have suppressed my emotions as I have all aspects of reality ... I don't feel things any more. I don't have normal sensations. I make up for this lack of sensations with reason. Since my illness began I have suppressed the impression of time. Time doesn't matter any more ... I feel that I can reason quite well, but only in the absolute, because I have lost contact with life.³²⁴

Once everything has to be worked out, calculated from first principles, life comes to a juddering standstill. The normal 'taken for granted' quality

of authentic experience in the flow of time is lost, and in its place everything is doubted. Another schizophrenic subject, described by Thomas Fuchs, began by doubting that his familiar possessions were still his from moment to moment. He moved on to doubting that his arms were his (once again we are reminded of Descartes, who doubted he had a body):

He had to carefully observe his arms from the hands up to the body in order to make sure that they were his own, and he repeatedly looked behind himself in order to see if there was not somebody else who moved them. Now he could not trust his own hands any more, and doubted the simplest actions ... Every *movement was like an arithmetical problem* that had to be pondered over with extreme concentration. So he became stuck in his everyday performances and felt more and more desperate.³²⁵

Literalism

When you doubt everything, all meaning that is not literal and unambiguous becomes a threat: how to make sense of it? The psychotherapist Darian Leader describes a man whose grip on reality became so tenuous after his father's death, that he became radically unsure of all meaning, and was obliged to carry 'a huge dictionary' strapped to his back wherever he went.³²⁶ We know that in schizophrenia there is a degree of literalness (as distinct from concreteness), that comes from an inability to understand metaphor, and goes with 'thingification' (reification). Both people with autism and schizophrenia may become preoccupied with the goal of attaining certainty of meaning, and tend to be literal-minded. They are, once again, similar to right brain-damaged subjects in this respect (see Fig. 19).³²⁷ A patient, observing that he was lacking 'a *seat* in my life', started building an armchair on which he engraved proverbs, so as to 'have his place, like the others, in everyday life'.³²⁸ Another made a present of a wine-stopper to her analyst, believing him to be an alcoholic like her father, and that a wine-stopper would 'stop' him drinking wine.³²⁹ And, since we are speaking of literal-mindedness, Leader also records that a group of patients at a French hospital asked their psychiatrist if they could have the Name-of-the-Father implanted surgically in the brain, after they heard it

was absent in psychosis.³³⁰ It is hard to get less literal than the Name-of-the-Father (*le nom du père*), a fantastic abstraction invented by Jacques Lacan, as part of his imaginative, but unsupported, schema for explaining psychosis as an imperfect separation from the mother. A triumph of literal-mindedness, an inability to deal with the purely implicit, and indeed a fear of humour (as dangerously dealing in the implicit) are also identifiable in public discourse today.

Hyper-consciousness

A defining element of the modern predicament is a degree of hyper-consciousness that inhibits our ability to tap into embodied skills and intuitive wisdom – making us ever less spontaneous (everything must be passed, checked and planned beforehand). The problem is that the left hemisphere is foregrounding something that must, to be effective, remain in the background. We have lost awareness of the importance of the spontaneous and implicit. And so it is in schizophrenia. Here are five different patients speaking:

- None of my movements come automatically to me now. I've been thinking too much about them, even walking properly, talking properly and smoking – doing anything. Before they would be able to come automatically ...
- People just do things, but I have to watch first to see how you do things ...
- I have to think of what I am going to do all the time and that takes up a lot of energy and when I am doing something I am aware of my every movement ...
- I have to do everything step by step, nothing is automatic now. Everything has to be considered ...
- I am not sure of my own movements any more. It's very hard to describe this but at times I'm not sure about even simple actions like sitting down. It's not so much thinking out what to do, it's the doing of it that sticks me ... ³³¹

This spotlighting, or focussing in on, what should remain in the background lies behind many schizophrenic symptoms; in keeping with this, figure-ground perception is impaired in schizophrenia, especially in those with ‘negative’ symptoms.³³² (‘Negative’ symptoms refers to the absence of something present in normal subjects – eg, a loss of motivation, or of affect; ‘positive’ symptoms refer to the presence of something absent in normal subjects – eg, hallucinations or delusions.) This in turn is consonant with the loss of visual depth that is experienced in both schizophrenia and right hemisphere damage.

Minkowska reports that for one patient ‘everything has to correspond to a plan fixed in advance: “I can’t trust to chance”, he says, “one must have foreseen everything”.’³³³

Of another, ‘all idea of chance, coincidence, of unintentional or unconscious acts was wiped out for the patient’, writes Minkowski.³³⁴ This loss of spontaneity alienates one from life itself. Whenever ‘an individual’s sense of the flow of life has come to a stop or been frozen’, writes Binswanger,

... that person can no longer realise himself, no longer mature, and will lose the capacity to make rapport and emotional contact with others ... The connection between *manneristic behaviour* and schizophrenia is a particularly close one. It can be regarded as a ‘loss of sparkle’, a freezing and *repetition* of present existence, and a reflection of the intellectual side of man’s nature rather than the ‘free play’ of individual life forces. It is as if there is an ‘iron net’ round the free expression of gestures, an invisible and incomprehensible force which is stifling the natural flow of life ... Minkowski’s patient [the patient who thought that even sexual sensations were reducible to mathematics], a school-teacher who rigidly applied certain pedagogic principles without regard to whether they were appropriate, is another example of how schizophrenia desiccates and denatures existence, leaving only a shell or a mask of what life is really about.³³⁵

I would ask the reader again not to be so literal-minded as to see this only as an expression of an illness, but also of the way the world begins to

become when we privilege the left hemisphere's take at the expense of that of the right.

Representation

I have mentioned the loss of flow several times. We saw in Chapter 2 that flow in time sometimes becomes a succession of still frames in right hemisphere damage. Loss of the sense of flow, particularly in time, has been repeatedly fingered by many distinguished psychiatrists as the core abnormality in the psychopathology of schizophrenia, from which all others stem.³³⁶ Normally, for the rest of us, when time itself is experienced, it flows seamlessly; when it is *re-presented* – the business of the left hemisphere – it is spatialised: become a line in space that can be retrospectively broken up into segments. Because of our reliance on visual re-presentation of time, we too have come to see it spatialised in clocks and watches, either analogically or digitally. Since this topic is so important, necessarily involves an exploration of the nature of time in its own right, and graphically illustrates the importance of how we come to understand time, I will postpone a discussion of the experience of time in schizophrenia to a later chapter (Chapter 22). For now it is enough to note that the experience of time breaks down.

With the loss of time, flow and continuity, Binswanger noted that only 'a shell or a mask' remained of what life really is. That 'we are the hollow men', mere husks, is a modernist theme, and a common element of schizophrenia ('no inside of the body, but only a frame'): the substance is gone and only an empty structure remains. Presence relies on the right hemisphere, and in its overshadowing by the left hemisphere, re-presentations take over.

The confrontation with representations only, not with the felt presence of what is living, results in a sense that all is mere shadow play, insubstantial and ultimately unreal. Rather like the fabled Potemkin villages – façades supposedly erected along the route taken by the Empress Ekaterina, only to be taken down after she passed and hastily reconstructed further along the banks of the Dnieper in order to impress her – Sechehaye's patient Renée describes 'paste board scenery of unreality ... even the sea disappointed me a little by its artificiality.'³³⁷ The sea? In a similar way

Schreber found that at a station people merely ‘gave the impression of being’ railway passengers; the people who attended him in hospital were merely ‘fleetingly got up’, like mannequins.³³⁸ One of Louis Sass’s schizophrenic subjects thought farmers were not really tending the fields, but simply going through the motions,³³⁹ putting one in mind of the account by Demay and Renaux of a head-injured soldier according to whom the whole First World War was make-believe, an elaborate performance.³⁴⁰

This trope is common in modernist novels and films: it forms the basis of the well-known film *The Truman Show*. More generally, the confusion between the plane of representation and the plane of the reality that is being represented is behind the breaching of the ‘fourth wall’. It also underlies the vision of reality as just the projection on the walls of a prison cell in the head: there is no direct perception of and no direct contact with the world. ‘On the contrary’, write de Haan and Fuchs,

instead of directly seeing something, they looked at images transmitted to them by a camera ... and they themselves were far away from the world where these images originated. This distance between the subject and his experiences conveys the classical picture of a homunculus sitting ‘at the back of the head’.³⁴¹

In losing reality, things become mere representations, abstract generalities, and in becoming abstract generalities they lose their reality. We have seen that a loss of uniqueness is strongly associated with damage to the right hemisphere, and so it is compromised in schizophrenia: ‘an individual’s existence is losing its personal quality and uniqueness and becoming a mere *copy* of some general way of life’, writes Binswanger. ‘A person loses his individuality and becomes typical of a certain class of people.’³⁴² Engagement with real persons is replaced by a utopian interest in abstract humanitarian values: ‘I love Mankind, but I detest humans’.³⁴³

According to a patient of Minkowska’s:

I have managed to detach myself from the realm of the material, and in my actions I am guided by impersonal principles. I respond not to a limited environment, but to the whole world. I’ve come to live for the idea and look on people impersonally. I’ve been united in

thought, not with human beings, but with humanity, and sought as far as possible to attain the absolute. I've submerged my filial love in a greater love.³⁴⁴

This too is not confined to schizophrenia: it is a matter of observation that those who espouse grand theories supposedly based on love for mankind, are by no means the kindest people one meets; and those that are innately suspicious of such schemes often surpass them in generosity and kindly warmth towards actual human individuals.

The imaginary lover of Tatossian's patient Hélène Jacob is blended with the son of Marie Stuart, the Duke of Gloucester and other public figures, had starred in a film with Charlie Chaplin, but was also entirely generic: 'the man of iron, of the World of Today and Tomorrow – the One and Many of the Sciences', and so on: 'he will be my liberator and the Liberator of the human race.'³⁴⁵ He was also in everyone and everywhere, in every word that was spoken on the radio.³⁴⁶ Her own father would have become one of the 'Great Eminences of this World', like Stalin.³⁴⁷ In the words of Minkowska:

For an individual who does not feel, does not act, does not trust his impressions, but merely thinks, reflects, analyses, looks for proofs – and never embraces the whole, but breaks everything down into little details – the fatal consequence is that all is reduced to a mental *representation*.³⁴⁸

The world is once more flat

Everything comes to be a representation: not just that time is spatialised, but that space comes to lack depth. In both time and space there is a dimension missing, the one that gives depth. One of Fischer's patients reported that three-dimensional reality had flattened into a two-dimensional image:

I was as if cut off *from my own past*. As if it had never really been, just shadows ... Then the past switched round: everything got mixed

up, but not in any way you could understand ... it was as if a picture with *depth of perspective collapsed and suddenly flattened*.³⁴⁹

Here are another four patients, all of whom express the ‘inauthentic’ nature of reality as mere representation:

- He used to be a drawing in a book but had finally escaped and come to the hospital ...³⁵⁰
- Everything lies in one line, there are no distinctions of depth any more ... Everything is like a motionless surface ...³⁵¹
- Things are no longer the way they used to be. They are strange, as if they only were silhouettes ...³⁵²
- [The world is] like a photograph ...³⁵³

I mentioned at the outset that to spatialise time is to kill it. There is in schizophrenia ‘a pathological predominance of criteria and elements of a spatial order to the detriment of vital dynamism.’³⁵⁴

La machine infernale

Remember Binswanger spoke, in one and the same phrase, of ‘a freezing and *repetition* of present experience [his emphasis]’. When time stands still, this leads to lifelessness, and monotony – but to *repetition*? Though repetition induces a sense of lifelessness and monotony, the one thing that can’t happen if time stands still is repetition. But to the schizophrenic subject everything seems to be a re-presentation of something else *immediately that it happens*. All that is *is* the representation, since, for the schizophrenic subject, the original no longer exists. Nothing is ever truly fresh, new, creative; for that the right hemisphere needs to be functioning normally. Everything has the air of familiarity from the word go, because everything is experienced left hemisphere fashion: after the fact, already known, as something that is from the outset already represented – and therefore *repeated*. Remember the patient who saw ‘the future as a repetition of the past’. It is already tired, generic, categorised, drained of life.

Minkowski, explicating Bergson, remarks:

From the very fact that it is always striving to reconstruct what is there, intelligence [LH] cannot capture what is new at any moment in history. It has no room for the unpredictable. It rejects anything creative. Preoccupied only by repetition and similarity, intelligence cannot appreciate the changes produced by time. It ignores the fluidity inherent in things, and petrifies everything it touches.³⁵⁵

The left hemisphere world, we have seen, gets ‘stuck in set’. The right hemisphere plays the decisive role in avoiding repetition.³⁵⁶ Here it is worth comparing the speech of the disconnected left hemisphere in split-brain patients, which is not just lacking in emotional nuance, but remarkably repetitious. Dimond comments:

It is a surprising experience to revisit these patients after two years to find many of them saying almost exactly the same things, and in a virtually identical manner as on a previous visit ... *time stands still* not only because of poor memory but rather because the same thoughts, the same mental content, are still circulating in much the same way.³⁵⁷

Indeed ‘reality, as it was formerly, no longer exists’, says another: ‘real life has suffered a decline.’³⁵⁸ I am forcibly put in mind of Walter Benjamin’s saying already in 1936 that in the modern era ‘experience has fallen in value. And it looks as if it is continuing to fall into bottomlessness.’³⁵⁹ And of Ferdinand Kürnberger’s dictum ‘*das Leben lebt nicht*’ – ‘life doesn’t live’.³⁶⁰

Consequently there is a need to re-present constantly – the left hemisphere’s mode of being – after the fact – in an attempt to produce continuity. This is like Descartes’ remark that the world must be constantly reconstructed at every moment or it disappears. Indeed, one of Jaspers’ patients actually says ‘the world must be *represented* or the world will disappear’.³⁶¹ One schizophrenic subject felt he must actively put together the fragments of time which he captured in photographs in order to reassure

himself that the world existed.³⁶² And hence comes the very modern necessity of *recording*: repeating experience in representation. No longer present and hence experienced, time for the left hemisphere becomes a frozen record. ‘We see’, writes physicist Lee Smolin, ‘... that the process of recording a *motion*, which takes place in time, results in a *record*, which is frozen in time – a record that can be represented by a curve in a graph, which is also frozen in time.’³⁶³

One patient, a single unemployed man living alone, photographs the landscape that he sees from his window – this is his sole employment. Repeatedly he shows these photographs to his psychiatrist and comments: ‘Here there is a car ... there the car did not move during the night ... This is the same car on another day, there are dead leaves on the roof.’ He comments, ‘Time goes by, things do not change. *I find time with photographs.*’³⁶⁴

Daniel Schreber experienced, like many schizophrenic subjects, ‘influencing rays’:

the approaching rays were sent down with the phrase, ‘We have already got this’, *scilicet* [that is to say] written-down ... For example, when I saw a doctor my nerves immediately resounded with ‘has been recorded’, or the senior attendant – ‘has been recorded’, or ‘a joint of pork – has been recorded’, ‘railway – has been recorded’ ... All this goes on in endless repetition day after day, hour after hour.³⁶⁵

The first book-length account in English of a psychotic subject is John Haslam’s description of James Tilly Matthews, a patient at the Bethlem Royal Hospital, popularly known as Bedlam, published in 1810. Its original title was *Illustrations of Madness: Exhibiting a Singular Case of Insanity, And a No Less Remarkable Difference in Medical Opinions: Developing the Nature of An Assailment, And the Manner of Working Events; with a Description of Tortures Experienced by Bomb-Bursting, Lobster-Cracking and Lengthening the Brain. Embellished with a Curious Plate.*³⁶⁶ Matthews, a London tea merchant, believed he had unearthed a conspiracy that involved heads of state all over Europe and was leading to tumult, revolution and war. His mind and the minds of others were being controlled

by an elaborate machine which he called the 'Air Loom', manipulated by men with bellows and emitting influencing rays that controlled his every movement, and led to unpleasant bodily effects ('bomb-bursting', 'lobster-cracking', 'thigh-talking', 'fluid-locking', 'stone-making', 'brain-saying', 'knee nailing', 'vital tearing', 'fibre ripping' and 'apoplexy-working with the nutmeg grater'); and he illustrated it with precision worthy of an architect or engineer. (It is perhaps worth noting that an heirloom, an object valued for the fact that it is an embodied connexion between a succession of individual human lives over a stretch of time, should become paronomastically transformed into a timeless mechanism dealing in immaterial air.)

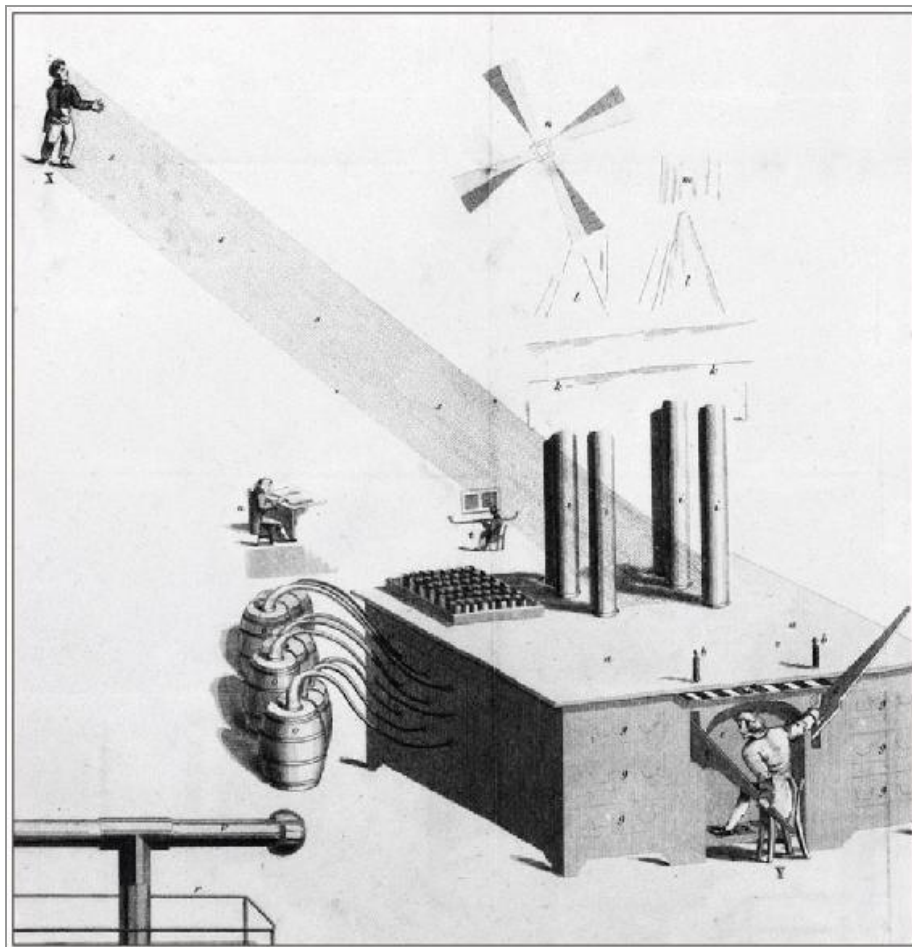


Fig. 26. The Air Loom, engraving by John Haslam, based on a machine described by James Tilly Matthews (from Haslam 1810)

My reason for referring to it here, though, is that it was the job of one of the imaginary gang, Jack the Schoolmaster, to be the recorder of everything that took place. All Matthews' experience was meticulously recorded. In fact the recorder can be seen at his desk, in the illustration, just beyond the *machine infernale* (see detail in Fig. 27). This may have something to do with the note-keeping that was part of the formalities of those attendants in whose care he was placed, but it seems far more essential than that. As Haslam, the apothecary, took notes on Matthews, Matthews, the patient, took notes on Haslam: much the same is true of Schreber's relation with his attendants. But that in itself is not without its significance. It is the beginning of systematic record keeping that forms the basis of any bureaucracy. (One of the most chilling aspects of the Holocaust is the bureaucratically meticulous, scientifically 'objective', recordings of deaths in the camps.)

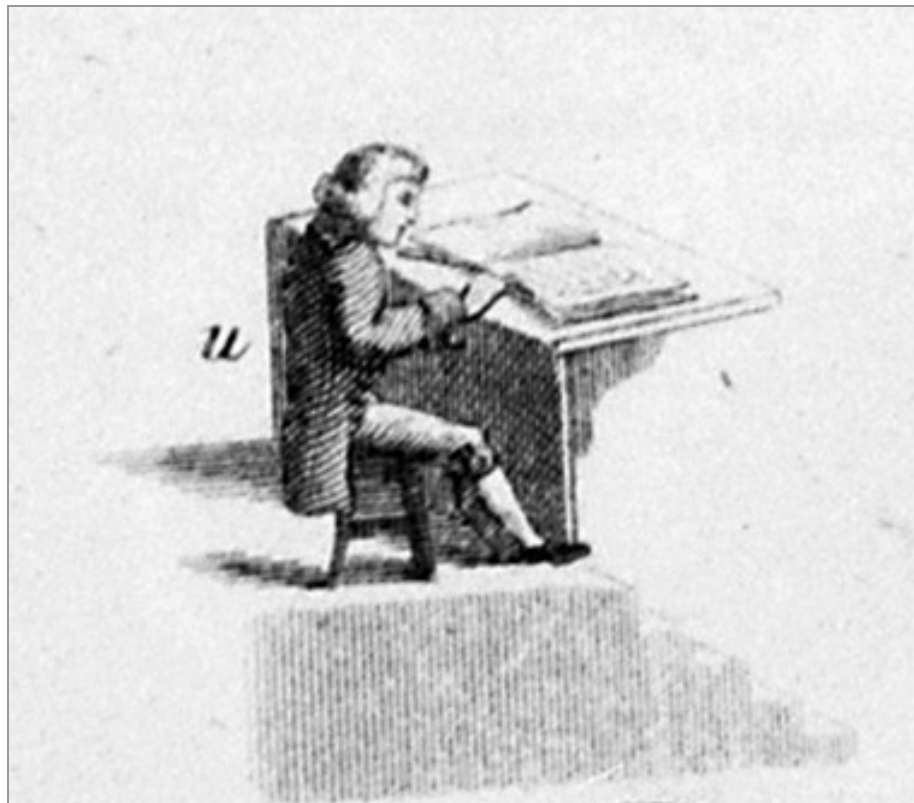


Fig. 27. Detail of Fig. 26, showing the recorder, Jack the Schoolmaster

‘The voices and so on were not that important’, says one patient with schizophrenia. ‘I think that the enduring and pervasive feeling of being unreal is the disease itself. When I realised this condition of looking at myself *as in a movie* was permanent, I understood it would eventually destroy the core of my life.’³⁶⁷ And Tatossian’s patient H       saw herself involved in a gigantic *picture*, ‘where all that I think is *written down in black and white* ... before the eyes of the whole universe’.³⁶⁸ A modern dystopic fantasy – or is it becoming the reality?

There is a saying in modern ‘managed’ hospital medicine, designed to stress the importance of keeping accurate records: ‘if it’s not recorded, it didn’t happen’. (Interestingly, for the Greeks, while literacy was still not common, live testimony was required to affirm the truth of a piece of writing, not the other way round.)³⁶⁹ While this is a necessary part of accountability, and is not in itself reprehensible, it does actually state that representation is more real, at least in some contexts, than what actually happened at the time. Nurses and other care-givers have to spend so much time recording what they do that they have little time left in which to do it; the police are similarly handicapped, and I suspect that not even the self-employed are able entirely to escape this blight on life. The record is frozen, but life has flowed away, as life does. And in our left hemisphere-dominated, record-obsessed age, I have heard people say the same thing about taking photographs of their lives: ‘if it isn’t recorded, it didn’t happen’.

The habit of mind has spread into the fabric of life itself. One celebrated photographer was made miserable for years by seeing a natural scene so beautiful that, to him, it demanded to be recorded, at a moment when he had no camera with him.³⁷⁰ I mentioned earlier that one might think of left hemisphere prepotency as like confusing the map with the world that it maps. Social media, with its endless recording of the trivia of daily life, often seems like that. A Spanish professor of animal physiology, a presumably intelligent man, records everything – *everything* – he does. ‘It occurred shortly after turning 40’, he says. ‘I was looking back on my life and wondering what did I have to *show*?’ (Literally to ‘show’ for his life: there is an alliance here with the man who didn’t have a *seat* in life.) So he started writing down everything he did, saw, ate – thus ensuring that he would have nothing whatever to show for the rest of his life, apart from the fact that it had been recorded. Then he started taking photographs every 30

seconds. He has now accumulated more than a million photos. Unsurprisingly, he says he ‘hasn’t seen a lot of them ... It’s almost too much to go through.’ He admits that ‘really my devices, looking back, tell me little, except that intensity is hard to capture.’³⁷¹ The pointless details overwhelm and kill. Sterne was the first to spot and parody this modern tendency in the mid-eighteenth century: now we have Facebook accounts of the minutiae of empty lives.

At such moments two things come to mind. One is Faust’s pact with Mephistopheles, the most famous lines in German literature:

Werd’ ich zum Augenblicke sagen:
Verweile doch! du bist so schön!
Dann magst du mich in Fesseln schlagen,
Dann will ich gern zugrunde gehn!

(‘When I say to the moment “Stay a while, you are so beautiful”, then you can shackle me in chains: then I will gladly perish.’)³⁷² And the other is Blake’s

He who binds to himself a joy
Does the wingèd life destroy;
He who kisses the joy as it flies
Lives in eternity’s sunrise.³⁷³

This is not just a ‘Romantic’ insight. Here are lines from Bashō, the great seventeenth-century Japanese poet of *haiku*:

To stop a thing would be to halve a sight or sound in our heart.
Cherry blossoms whirl, leaves fall, and the wind flits them both
along the ground. We cannot arrest with our eyes or ears what lies in
such things. Were we to gain mastery over them, we would find that
the life of each thing had vanished without a trace.³⁷⁴

Freezing time kills. Our age is one of re-presentation: photography, sound recording and film have become so important to us that they can

come almost to supersede direct experience. We talk about an aide-memoire, as though we were preserving a memory. But research shows that photographs actually erode memories.³⁷⁵ The effect of taking photos is that they *substitute* for memories, as you can verify by thinking back to any travels you made some years ago of which you still have photographs: the photos tend to crowd out memory of all else. And time is sliced.

Nothing flows: continuity vs countability

Figures are particularly attractive to many people with autism. In many, but not all, cases this seems to go with seeing numbers as absolutes, rather than as relationships – they can of course be seen as either. Jedediah (sometimes Jedidiah) Buxton, an eighteenth-century autistic *savant* from rural Derbyshire, who had quite amazing powers of mental arithmetic, though he was illiterate and could not even sign his name, calculated the product of a farthing (the 960th part of a pound) doubled 139 times. The result, expressed in pounds, extends to 39 figures. He afterwards multiplied this enormous number by itself. He astonished the Royal Society in London with his capacity for carrying out calculations of unbelievable complexity. While in London, he was taken to see Garrick performing in Shakespeare's *Richard III* at Drury Lane, which must have been an astonishing experience for a poor labourer from a rural backwater in the middle of the eighteenth century. But he was unable to focus on anything but numbers. After the play he was asked whether he had enjoyed it. He had nothing whatever to say about the drama, the acting, or the human tragedy, instead noting merely that the actors had spoken 12,445 words, and that 5,202 steps had been taken during the dances.³⁷⁶ In an observation which reflects the difficulty autistic individuals experience in broadening focus so as to take in several stimuli at once and make global sense of them, he reported, after hearing 'a fine piece of musick, that the innumerable sounds produced by the instruments had perplexed him beyond measure'.³⁷⁷

Things that flow have only artificially imposed beginnings and ends, and so defy enumeration. If the frame-freezing mentality of the left hemisphere takes over, the flow is replaced by any number of countable steps. The trouble is the countable steps can be measured but they are simply not the dance or the play. In a fascinating move, again redolent of

both scientism and contemporary culture, for some subjects on the schizo-autistic spectrum, if it can't be *measured*, it doesn't exist. A patient of Minkowska's, a teenage boy, reports:

The gym teacher had taken my measurements: but not the measurements of my legs, which led me to think that my legs were somehow mutilated. *In reality to me the absence of measurements of my legs meant the absence of legs.*³⁷⁸

Sass quotes a schizophrenic patient: 'I feel as if I've lost the continuity linking the events in my past. Instead of a series of events linked by continuity, my past just seems like disconnected fragments. I feel like I'm in the infinite present.'³⁷⁹ The 'infinite present' is nothing like 'always being present' – nearer to being the opposite: *never* truly being present at all, because of being outside the flow of time. The narrative of a life, which gives meaning to the self, is no longer recoverable.

We have seen that the right hemisphere understands narrative, where the left hemisphere has difficulty. Like right hemisphere-damaged subjects, autistic people show impairments in both generating and comprehending narrative, as do people with schizophrenia.³⁸⁰ Narrative is indeed the ground of human meaning; but this is not to say, incidentally, as it is sometimes presented by psychologists and philosophers, that we *invent* fictional narratives and therefore *invent* meaning, which we paint onto our lives like a mural, in order to shelter us from its barrenness. Narratives are not scientific facts but may be more true to life than any scientific facts can hope to be. It is true that we shape and tweak the narratives of our lives according to our assumptions. But they are more properly said to be discovered than invented. It is the left hemisphere, which does not understand narrative, not the right, that wholly makes up 'stories' to fit circumstances it does not understand. Michael Gazzaniga calls it the interpreter precisely because of this propensity confidently to make up something, plausible or not, to explain a set of circumstances it cannot account for. Life, rather, has no need of *extrinsic* meaning because to those who intuit and are alive to the implicit it has a wealth of *intrinsic* meaning, and spontaneously occurring narratives are the best way to embody that meaning, to communicate it and to celebrate it. Those who can operate only

explicitly – essentially those somewhere on the schizoid-autistic spectrum – have difficulties understanding human meaning of any kind. To them narratives are somewhat alien, and stories are lies (as children say, ‘telling stories’); they are ‘fables’, ‘myths’ – words that once denoted truths, but which now suggest deceptions.

At times the self is experienced as split in half (a phenomenon known as *Ich-Spaltung*) or alternatively duplicated. Hélène Jacob felt herself ‘*dédoublée*’ – a word which can mean either ‘duplicated’ or ‘split in two’.³⁸¹ This can be seen as a version of the Capgras phenomenon applied to the self. Because there is no continuity, change means not natural progression, but the substitution of one unchanging entity for another. A patient of Kimura’s reports

I am not able to *feel myself* at all. The one speaking now is the *wrong ego* ... When I watch television it is even stranger. Even though I see every scene properly, I do not *understand the story as a whole*. Each scene *jumps* over into the next, there is no coherence. Time is also running strangely. It falls apart and no longer progresses. There arise only innumerable separate *now, now, now* – quite crazy and without rules or order. It is the *same with myself*. From moment to moment, various ‘selves’ arise and disappear entirely at random. There is no connection between my present ego and the one before.³⁸²

One remembers that ‘no connection between my present ego and the one before’ is a position argued for by some modern analytic philosophers.³⁸³ It is also implicit in Descartes’ conception of time as constantly renewed instants.

Loss of the sense of reality

In this alienated state, the glue that holds the self together disintegrates. There is ‘a constant feeling that my self no longer belonged to me’, complains one patient:

The real ‘me’ is not here any more. I am disconnected, disintegrated, diminished. Everything I experience is through a dense fog, *created by my own mind, yet it also resides outside my mind*. I feel that my real self has left me, seeping through the fog toward a separate reality, which engulfs and dissolves this self ... I am an automaton, but nothing is working inside me ... ³⁸⁴

Note that the patient claims that experience is simply created by the mind, and yet that one does not even have the comfort of living it – instead standing somehow outside one’s own experience, observing, not inhabiting it. I suggest this is highly characteristic of the left hemisphere’s world-picture. Because its ‘experience’ is not in touch with the presencing of life known to the right hemisphere, and it therefore experiences its own *representation*, it seems to itself to live in a self-enclosed theatre, where experience is projected on the walls of the cell: ‘created by my own mind’, like the world as imagined by certain philosophers and psychologists. ³⁸⁵ In fact another patient gets even closer to a position promulgated by a number of popular materialist philosophers: ‘the world is an illusion *because* it’s seen through a brain’. ³⁸⁶ And *because* it is dealing with a representation, it feels itself to be somehow outside the experience, and the normally experiencing self dissolves, leaving just a husk, a mechanism, in its place. To the right hemisphere, by contrast, what is experienced carries with it the stamp of authenticity – it is in contact with something beyond the mind, not just invented by it; and yet it is also experienced from *within* – not at a distance, and from without.

The hall of mirrors

The world now becomes self-enclosed in such a way that symbols refer to other symbols, signs to other signs, ideas to other ideas, language to other language, without so to speak breaking out of this hermetic space to what lies beyond. What is true is what it says ‘on this piece of paper’. ‘There is a pane of glass between me and mankind’, a schizoid patient remarked, an observation which Kretschmer describes as of ‘extraordinary significance’. ³⁸⁷ ‘A wall of brass separates me from everybody and everything’, more forcibly wrote Margaret Sechehayé’s patient, Renée. ³⁸⁸

Under such circumstances, words can lose their purchase on reality and begin simply to refer endlessly to one another, another position that used to be fashionable in humanities faculties. Patients are more likely to experience a partial or complete divorce of word from meaning, of signifier from signified, such that words can begin to appear absurd or meaningless.³⁸⁹ Words may be treated, Humpty-Dumpty fashion, as having slipped their moorings in the shared world and become subject to the will of the omnipotent subject to mean whatever he likes; or alternatively as imbued with some magical power, and having a life of their own.³⁹⁰ Again there is an only apparent duality here, which in fact reflects the same underlying problem, a loss of connexion between mind and world. We are back to the loss of betweenness. When the right hemisphere is not functioning well, all is reflected back internally. 'My world sometimes felt like a distorted house of mirrors', complained one schizophrenic patient, 'reflecting infinitely inward upon itself.'³⁹¹

The loss of vital contact with reality leads to a sense of simultaneous omnipotence and impotence, grandiosity and cosmic insignificance, in schizophrenic subjects. Solipsistic subjectivity on the one hand (with its fantasy of omnipotence) and alienated objectivity on the other (with its related fantasy of impotence) tend to collapse into one another, and are merely facets of the same phenomenon. Both imply isolation rather than betweenness, the vital tension that gives authenticity to experience. If the world is truly bounded in your nutshell, then you are as good as king of infinite space. If our private experience is reduced merely to physics, its value is destroyed, just as physics is destroyed by being reduced merely to private experience. If I am everything, there is no reality to contact, and nothing for me to influence; if I am nothing, I cannot contact reality, and I can, by definition, have no influence. Both conditions lack the normal sense we have of ourselves as happily limited, defined by the relationship we have with others and the world 'beyond' ourselves.³⁹² What is missing altogether is the second person voice.

As Pascal put it, evoking a less grandiose conclusion than either of the histrionic alternatives:

Let us, then, understand our condition: we are something and we are not everything. Such being as we have removes us from knowledge

of first principles, which arise out of nothingness. And the smallness of our being conceals from us the sight of the infinite.³⁹³

One of the features of left hemisphere thinking is its tendency to ‘either/or’ thinking, while missing the ‘maybe’ area altogether. This tends to be replicated in schizophrenic thinking. It is very unusual for a person with schizophrenia to say ‘maybe’, or express qualified assent or dissent. If and when they do, you know they are decidedly on the mend. As Hölderlin developed schizophrenia, he incidentally invented the word *pallaksch*, meaning *either* ‘yes’ or ‘no’ – but never ‘maybe’.³⁹⁴

Only the right hemisphere is able to see that what seem to be opposites coexist and are necessary to one another – indeed, that by stepping beyond mere opposition, and excluding neither, a new unity can be attained. This will be explored in greater depth in Part III, where it helps to illuminate the foundational elements of reality. The left hemisphere is unable to accept that what it sees as opposites not only do not necessarily cancel one another out, but cohere. When the cohesive vision of the right hemisphere is lost, the left hemisphere seems to sense something is missing and strive for it, but in doing so veers, unstably, from one pole to the other, thus reinforcing the sense that the world is meaningless, perplexing and uncanny.

On the one hand the patient may experience himself as what Sass describes as the ‘subjectless subject’, describing simply a mass of impressions (a little like the ‘characters’ in Virginia Woolf’s *The Waves*), without the coherence that would be given by a unique living mind-and-body with a personhood and history. On the other hand he may seem convinced that the only way to understand anything, including himself, is by geometric pictures and diagrams, or mathematical rules, that ensure ‘objectivity’: pictures or diagrams which are meaningless because of the lack of connexion to a coherent experiencing subject. According to Ernst Kretschmer, schizoid people are ‘full of antitheses, always containing extremes, and only missing out the means’.³⁹⁵ As we have seen, subjects may complain of being imprisoned in the self and yet of their physical bounds being invaded; they often see living beings as mechanical and yet may see inanimate objects as having a life of their own. Although each of these pairings look like opposites, they in every case have a common nature. And although, as a group, they seem to concern a number of distinct elements, they are related to one another, and could be seen as different

facets of the same disturbance, in which the cohesion of self-and-world falls apart, and – whether as cause or consequence – the cohesion of each, the self and the world, also falls apart. Like a hologram, the whole is reflected in every (apparent) part.

Finally, at the core is one other important dipole, since the theme of this book is what we can reasonably hold to be true: belief and disbelief. As Sass has observed, the schizophrenic subject appears to occupy extremes simultaneously: both sceptical to the point of paralysis about matters that must be taken for granted if one is to function at all, and yet gullible enough to espouse enormously improbable belief systems that are clearly delusional. Once the theoretical mind is untethered from the body and community, in which it is grounded, and from which it receives its intuitions, there simply is no longer any solid basis for discriminating truth from untruth. And once again one sees parallels in some kinds of contemporary philosophy, and some kinds of belief systems driven by the irrationality of identity politics, which lead subjects to doubt everything except the validity of a bizarre conclusion which they feel driven to accept by formal rules. But never doubting the rules.

SUMMARY

If you have hitherto been reading summaries only, this might be a chapter to pause on and delve into, because no summary can convey the richness of the living material from the mouths of patients, conveying something both very strange, and increasingly familiar to those of us living in the modern Western world: what happens when the right hemisphere's contribution to understanding the world is neglected.

There are extensive and very striking points of similarity between the changes that happen to the experienced world consequent on right hemisphere dysfunction and those found both in schizophrenia and, to a very considerable extent, in autism. Underlying abnormalities of both structure and function in the right hemisphere have been identified in both conditions. However, given that one of the underlying abnormalities is, precisely, abnormal lateralisation of both structure and function in the brain, it is less certain how to interpret them. Naturally I do not contend that either autism, or schizophrenia, is *merely* a right hemisphere deficit syndrome: it is obviously more complex than that. I think, however, that it cannot be denied that they have, in a host of respects, remarkably comparable phenomenology.

For a number of reasons, we have more extensive and detailed accounts of their experience from subjects with schizophrenia and autism than we do from subjects with right hemisphere injury, stroke or tumour. Western modernity has many overlapping features with the phenomenology of schizophrenia, as Louis Sass has convincingly demonstrated in *Madness and Modernism*; and I submit that this is because modernity simulates not a disease state, but a hemispheric imbalance, as I suggested in *The Master and his Emissary*. The testimony of people with schizophrenia and autism provides us with articulate accounts of what living in the left hemisphere's world feels like, when most fully expressed. Such accounts help to make sense of apparently disparate phenomena around us, and give us a perspective on our unexamined assumptions about the fabric of reality – in one sense, the whole purpose of this book.

CODA TO PART I

What do we learn from all this? The main point in Part I has not been so much to demonstrate the left hemisphere's weakness in this or that area: it has been to demonstrate that the differences are stark in every area relevant to making sense of the world. What I think I have shown in these chapters is that the left hemisphere is, compared with the right hemisphere, unreliable in just about every way that matters. In terms of attention to the world, and its role in thereby constructing, and understanding, experience; in its inability to comprehend time, space and motion; in its lack of skill in conveying and interpreting emotion; in its (lack of a) sense of the body as a living inseparable part of the self; in the comparative weakness of its faculties for direct perception, for the evaluation of beliefs and for making judgments; and indeed in terms of its lesser intelligence (which means understanding): in all of these it is more vulnerable to falsehood, more likely to deceive us, than the right. What it can continue to do on its own is to produce language (while having only a partial grasp of the overall meaning of its utterances and those it receives from others), and to calculate (without necessarily understanding the overall meaning of what it is calculating).

You may well be reflecting that I must have unfairly neglected some aspect of the left hemisphere's *Wahrnehmung*, some aspect of its truth perception: it makes no *sense*, you may reflect, after all, that one entire hemisphere of the brain should be more veridical in almost every respect. In fact, however, the logic works the other way: it would be very odd if it were otherwise. And here's why.

It is not the extent of the difference between the hemispheres that we should be wondering at: it's the fact that there is one at all. After all, the world surrounds us on all sides, and the need to be in touch with it is, *prima facie*, equal for both hemispheres, no less for the left than the right. What is clear, however, is that there is a tendency in the left hemisphere to turn from the business of dealing with experience towards the process of abstraction and representation. As a result, the left hemisphere appears to have difficulty understanding the real world, the one in which we actually live, and move, and have our being. But then comes the realisation: *it doesn't have to*.

It is a little like a high-ranking bureaucrat, protected from the world which he or she must administrate: adept at knowing and observing the rules, but knowing little if anything about life as it is lived there. All that it leaves to the right hemisphere. A reporter on Mao's China wrote:

The original purpose of the so-called May Seventh schools was to allow bureaucrats to be periodically in touch with workers and peasants. In practice, nothing of the kind occurs: one cadre, when I asked him whether he lived with the farmers during the periods when he worked in the fields, was quite shocked by my question. One should know that since the May Seventh schools have been institutionalized, they have become bureaucratic islands in their rural environments. Their inmates plant cabbages and feed pigs, granted, but they do it *with other bureaucrats*, on the school grounds. Do they get any chance to learn about the life of the peasants? Of course! Once or twice a week some farmer comes and gives them a talk, and tells them how Chairman Mao and the Party have changed his existence out of all recognition.¹

The processes are self-referential, internally validating, and self-confirmatory. The serious problem for humanity is that the left hemisphere is prone to see the world this way and to 'go it alone'. Not knowing what it is it doesn't know, it tends to be overconfident it is right. This does not happen the other way round because the right hemisphere seems to be aware of its limitations, as well as of shades of meaning and degrees of truth; and it is more in touch with reality, while the left hemisphere prefers its theory about reality: there is an analogy with the effects of what

nowadays we'd call being inside a 'thought bubble'. As I aimed to show in *The Master and his Emissary*, this overconfidence in the left hemisphere point of view on the world has twice before heralded the demise of a civilisation, and I believe it is doing so for the third time as you read these words.

The right hemisphere-damaged subject, overly committed to the left hemisphere mode of simply putting together the pieces, joining the dots, and following procedures, is unable to appreciate that the picture he arrives at is bizarre and incoherent. He placidly accepts the preposterous nature of his conclusions, and, if things seem improbable or awry, he no longer feels the strange or surprising nature of them. They fail comprehensively to alert him, in the way that they normally should, that there is an aberration. In this he is like schizophrenic subjects, who adopt what Sass & Byrom call an 'anything goes' orientation, in which they 'quickly identify, accept and take in stride phenomena that most people would find anomalous, strange to the point of being difficult to recognize'.²

In a study by Howard Gardner's team as far back as 1981, after detailing the performance of the right hemisphere-damaged subject, the authors comment: 'It is as if the left hemisphere is a highly efficient, but narrowly programmed linguistic computer.'³

Indeed. The brain is often compared to a computer. This metaphor is one of the scourges of our time. The brain is nothing like a computer, nor does human memory have 'data banks' like a computer's. There is, however, just one respect in which the left hemisphere of the brain does function a little like the *brain's own* private computer: it is largely an intermediate processor. It is not a computer, with *no* contact with reality, *no* insight into what it is dealing with and relying heavily on routine procedures; but, compared with the right, it begins to look like that, and it does so more convincingly than any other aspect of brain functioning. As an intermediary, which is what it seems at best to be, contact with reality comes before and after the left hemisphere processing. Material from the real world as presencing to the right hemisphere is fed into a largely closed system, that of the left hemisphere, with its own rules and procedures, and then emerges to be reinterpreted in the real world once more, by the right hemisphere. Michael Gazzaniga's observation about what he calls the left hemisphere interpreter is spot on: 'that the interpreter is only as good as the data it receives is crucial in explaining many seemingly inexplicable

behaviours, of both normal brains and neurological patients. Indeed, if you feed the interpreter incorrect data you can hijack it. ... So perhaps, for our interpreter [the left hemisphere] process, reality is virtual.'⁴ That takes the words out of my mouth.

I demonstrated the evidence that perception in all modalities is attenuated in the human left hemisphere compared with the right. In the pre-human cerebral cortex, however, the left hemisphere is less *conceptual*, more *perceptual*. In monkeys and apes, for example, visuo-spatial skills are less lateralised, with more remaining in the left hemisphere than is the case in humans, where that territory has been colonised by abstractions.⁵ And, as if to confirm this, in some human individuals we can actually see a possible relic of the past: such subjects retain vestiges of visuo-spatial skills in the 'language' areas (for which, read 'concept-forming' areas) of the left hemisphere.⁶ As is often the case, ontogeny recapitulates phylogeny; that is, we can see a microcosm of the history of the species in the history of the individual (eg, human embryos have tails which they lose as gestation advances). Thus colour recognition, *including* the categorisation of colours, is right hemispheric in infants, but the *categories* of colour perception become left hemispheric in adults: 'as you learn the words for colour, as your categories become more linguistic, they become more left-hemisphere dominant', suggests one study's author.⁷ The trend has been for the left hemisphere to shift from perception to conception, from experience to abstraction, from life to language. If it has achieved that well, it will be not *patchily* less veridical than the right hemisphere, but consistently so across the board. And that is what we find.

It may be that the advent of language alone produces, and indeed requires, this distancing from reality, this degree of alienation in one half of the brain. And, as a corollary, it may be that, while depression, anxiety, obsessive-compulsive disorder and other psychological maladies exist in animals, as far as we know schizophrenia does not.⁸ It has often been surmised that there is likely to be a relationship between language and psychosis. I believe that this is correct. The question is usually pursued at the genetic or microbiological level, which is perfectly valid, and may one day prove positively useful, but is slightly like trying to understand Shakespeare by analysing the keystrokes that are required to type Macbeth. One misses what is going on at the human level.

What I am suggesting is this: in animals there may be no such thing as schizophrenia because, except in humans, both hemispheres still maintain their groundedness in the pre-conceptual world. Because of the ‘virtuality’ that has necessarily followed the left hemisphere’s primary preoccupation with the world of symbols, as far as reality is concerned we have ended with ‘all our eggs in one basket’: the one on the right. As a result we are particularly vulnerable to anything that impairs the right hemisphere, since it is our mainstay in reality.

Referring to the loss of power in the left hemisphere to make intelligent perceptions, Michael Gazzaniga writes:

That a lowly mouse can perceive perceptual groupings, whereas a human’s left hemisphere cannot, suggests that a capacity has been lost. Could it be that the emergence of a human capacity like language – or an interpretive mechanism – chased this perceptual skill out of the left brain? We think so...⁹

And so do I. The left hemisphere’s world is now an increasingly *virtual* world. It no longer even pretends to yield a faithful portrayal of reality. For that it depends on the right hemisphere. It has, it thinks, more important – certainly other – things to do. It is there to unpack the implicit in what it is given about the outside world, make it explicit and deal with it according to the rules. It is there to aid strategy. Unfortunately, by being purely strategic in intent, the left hemisphere makes strategic mistakes, since it remains largely ignorant of the reality on which it relies. As a sophisticated computer would. And very soon, no doubt, will.

I was very struck on re-reading Oliver Sacks’s *The Man Who Mistook His Wife for a Hat* after 30 years to come across this passage, germane in so many ways to our discussions:

The entire history of neurology and neuropsychology can be seen as a history of the investigation of the left hemisphere ... it is the right hemisphere which controls the crucial powers of recognising reality which every living creature must have in order to survive. The left hemisphere, like a computer tacked onto the basic creatural brain, is

designed for programmes and schematics; and classical neurology was more concerned with schematics than with reality.¹⁰

As Sacks points out, though right and left hemisphere strokes are equally common, one can find ‘a thousand descriptions’ of syndromes following left hemisphere stroke for every one description of a right hemisphere syndrome. He comments: ‘It is as if such syndromes are somehow alien to the whole temper of neurology...’

In Part I of this book we have seen quite how extraordinary, and how extraordinarily revealing, these right hemisphere deficit syndromes are: how much *more* important they are than left hemisphere deficit syndromes for human meaning.

There are two related consequences of such a state of affairs that appear diametrically opposite but, as so often, for that reason are closer than we are normally willing to accept. They are the coming together of unreasonable gullibility with unreasonable scepticism. The left hemisphere is both unreasonably willing to jump to conclusions (and stick to them), and inclined unreasonably to put in doubt the basics of existence. While it is extraordinarily credulous (believing that a paralysed arm functions normally), it will simultaneously exhibit doubt as to the most basic foundations of reality – believing that people are really all involved in a play-acting conspiracy, that their continuing corporeal being is an illusion, that they are not conscious but really machines, and so forth. This is entirely to be predicted. When you are out of touch with reality you will easily embrace a delusion, and equally put in doubt the most basic elements of existence. If this reminds you of the mindset of the present day materialist science and philosophy establishments, as well as of the loudest voices in the socio-political debate, we should not be particularly surprised, since they show all the signs of attending with the left hemisphere alone. I live in the hope that that may soon change: for without a change we are lost.

In *The Master and his Emissary* I explored the history of how this has come about, and how our world might be experienced if the left hemisphere were, finally, fully to subordinate the right hemisphere in the process. It is a frightening vision but one which to me and to many others is already familiar in the world around us. Many readers who share my deep alarm at the world we are creating asked the obvious question: ‘So, what’s the solution?’ Some may have hoped for a five-point plan, but of course there

isn't one. We need to address the problem at a much more fundamental level.

We need to look at the roots of the malaise. We need to do nothing less than reconceive our world, our reality in a way that, far from subordinating the right hemisphere, acknowledges that it alone has access to the world beyond us, 'out there'. We need to learn again to look, to see. That's to say, we need to redirect our attention to *what-out-there-is-not-us* in a way that rebalances the contributions of the two hemispheres so as to bring a world into being that is truer, richer and within which we can live less harmfully, more peacefully and with much greater fulfilment. How we might do that is the purpose of the rest of this book.

In Part II I want to explore what rebalancing the contributions of the hemispheres would entail for the paths that are available to us to follow in attempting to understand the truth about the world – paths that are of course themselves shaped and directed by the functioning of the hemispheres. Then, in Part III, I want to look at some of the key elements in that reconceived world as it comes into being when the more veridical hemisphere, the right hemisphere, is not subordinated to the left hemisphere, but is able to reassert its role as master to the left hemisphere's servant. It will become apparent how radically we have come to misconceive so much that we 'take as read'. And we shall see how very different the world is from the one we think we know.

PART II

The Hemispheres & the Paths to Truth

A philosophic outlook is the very foundation
of thought and of life. The sort of ideas we attend to, and
the sort of ideas which we push into the negligible background,
govern our hopes, our fears, our control of behaviour.

As we think, we live. This is why the assemblage
of philosophic ideas is more than a specialist study.
It moulds our type of civilization.

ALFRED NORTH WHITEHEAD¹

'True philosophy entails learning to see the world anew.

— MAURICE MERLEAU-PONTY²

¹ Whitehead 1938 (87).

² Merleau-Ponty 1945 (LXXV).

WHAT IS TRUTH?

Truth is a noun only to God; to men, truth is really best known as an adverb, ‘truly’.

—Rabbi Jacob Agus [1](#)

IN PART II, I WANT TO MOVE BEYOND CONSIDERATION OF THE DIFFERENT *means* made available by each hemisphere, to a consideration of the different *paths* human beings have adopted, in their approach to a truer understanding of the world we inhabit. I take it that these can be encompassed under the very broad, and to some extent overlapping, headings of science, reason, intuition and imagination. In the case of each path I will examine its claims to lead us towards truth, particularly in the light of what we know about the hemispheres.

In these times especially, truth is a pressing question for all of us; it is not enough to leave it to academic philosophers only. That’s in part because our beliefs about it not only help make the world what it is, but make *us* who we are.

No single overarching theory of truth can encompass everything we would wish from such a theory, and indeed truth is never finally known; but that does not in any way invalidate the attempt. We can at least point to what is unlikely to be the case, and indicate a more reasonable path to pursue. And if our aim is to take a new look at what we mean by reality through the lens of the hemispheres, we must begin with the nature of truth;

for each hemisphere is likely to have a different approach to truth itself, as to everything else.

That does not, however, entail that each idea of truth is equally valid. Indeed, one of the conclusions of this chapter, and ultimately of this book, is that one hemisphere's idea of truth is likely to be more fruitful than the other's. As we have seen in Part I, the aspect of reality revealed by the left hemisphere must be contextualised by being taken up into the broader, and deeper, overarching vision available to the right hemisphere; alas, when the left hemisphere takes the lead, it leads us astray. As always, it is a good servant but a poor master.

But if reality is always mediated by the two hemispheres, how can one decide which is more veridical? It has even been put to me that one would need a third hemisphere, so to speak, to decide. This is a lovely idea, but of course why stop there? How would one decide that the third had got there, unless there were a fourth, and a fifth, and so on? But this is to make a basic mistake.

I believe that, despite our always contributing to the reality we experience, there is *something* apart from ourselves to which we *can* be true – that reality, in other words, is not purely *made up by the brain*. There is a relationship there – something to be *true to*. Assuming there is something there to know implies that some understandings will inevitably be better than others. And since each hemisphere provides a different understanding of it, it is perfectly coherent – and indeed necessary – to ask which is superior. (The validity of the question is not affected by the observation that we can, and may be best to, use both.) If a pilot is flying blind and has two navigation systems to rely on, each of which, though they differ, provides significant information, the criterion for having to prefer one over the other is clear: following which one is less likely to lead to a crash. Or again, as a piece of music cannot be experienced without a player, who inflects what it is that we hear, there is nonetheless such a thing as a better or worse performance, one that is more or less faithful to the potential enshrined in the piece – a potential that *is*, essentially, the piece of music, and becomes realised in every true performance. The arbiter, then, in either case, is the experience of the whole embodied person as he or she responds to a more, or less, accurate – a richer, or poorer – account of the world.

Furthermore, if one such account, rendering or assessment was better able, at the same time, to incorporate the best of what was seen by its

counterpart, we should clearly prefer the one that saw the bigger, and better integrated, picture.

What would clearly be crazy would be to use the poorer system only: to admit only the poorer performance. That's the point at issue here. Because our current condition in the modern world, I suggest, is the consequence of doing just that.

EXPERIENCE: PRESENCING VS RE-PRESENTATION

The single most profound difference between the hemispheres, which I will have cause to return to repeatedly, is the distinction between the experience of something as it ‘presences’ to us in the right hemisphere, and as it is ‘re-presented’ to us in the left. Just because we so rarely deal with the world nowadays except as it is represented, and because we are used to mistaking the representation for the thing itself, the full significance of this may not be apparent. Yet as our awareness moves from one to the other, an extraordinary transformation takes place, like moving from a photo album into the living space that was photographed. The two are not necessarily in conflict, but neither are they at all the same kind of experience.

The word ‘presences’ is important, but sounds unnatural. Unfortunately we don’t have an available everyday term, or I’d use it. This in turn is fascinating: why don’t we have a verb to describe the experience of an encounter with reality that strikes us at once as of fundamental importance? The experience not being part of the left hemisphere’s repertoire, language has side-lined it. To ‘presence’ is not the same as to ‘be present’, which is too finished and inert, leaving little place for whatever is there to play an active part in the encounter; or, worse, to ‘be presented’, which is passive, and gets dangerously near to ‘being re-presented’. The shift from the noun (‘presence’) to the verb form (‘to presence’) signals a shift from a passive state to an active process, from a thing to a dynamic, two-way relationship. Historically English-speaking philosophers have adopted the verb ‘to presence’ as a way of translating Heidegger’s use of *anwesen* – though he, too, had to re-invent the verb from what, by his time, existed only as a noun. What I believe he meant by this word is something like to ‘reveal or disclose itself to us’, to ‘come into being for us’, with all the vital, pre-conceptual, active freshness that that suggests.

The whole of Merleau-Ponty’s philosophy of embodied understanding depends, in one way or another, on a fundamental distinction: that between two modes of encountering the world, which he calls ‘*je pense*’ and ‘*je peux*’.² The first deals with a mental representation in which we are quite separate from the world, and the question is, then, how our thoughts can be said to relate to that world; the second is an intuitive embodied awareness

of the world in which we are already fully situated, a field of potential for interaction, something that comes prior to any conscious re-presentation. I believe he was articulating the intuited difference – as have many philosophers, including Bergson, Peirce, James, Heidegger, Scheler, Sartre and Wittgenstein – between the world as understood by the left and right hemisphere, respectively.

Presencing is what the world does less of as we grow older. Wordsworth, the power of whose poetry is, precisely, that it causes the world to presence to us once more, famously lamented that ‘shades of the prison-house begin to close upon the growing boy’.³ The effect is accentuated in an era where so much of our experience comes already conceptualised in such a way that we are shielded from its awe-inspiring reality. So often now it comes in virtual form, second-hand, and pre-digested. Though she was writing more than a hundred years ago, Evelyn Underhill already saw the troubling modern submission to the world of representation, and expressed it, I think, brilliantly:

It is notorious that the operations of the average human consciousness unite the self, not with things as they really are, but with images, notions, and aspects of things. The verb ‘to be’, which he uses so lightly, does not truly apply to any of the objects amongst which the practical man supposes himself to dwell. For him, *the hare of Reality is always ready-jugged*:⁴ he conceives not the living, lovely, wild, swift-moving creature which has been sacrificed in order that he may be fed on the deplorable dish which he calls ‘things as they really are’. So complete, indeed, is the separation of his consciousness from the facts of being, that he feels no sense of loss. He is happy enough ‘understanding’, garnishing, assimilating the carcass from which the principle of life and growth has been ejected.⁵

One example of this process in action, and one which has already been, and will continue to be, important for the argument of this book, concerns our relation to space and time. The process of re-presentation, of (literally) striving to make something present again as it were ‘after the event’, ignores the significance of time. This is already a considerable step away

from reality. When we think about time, only a massive effort of will can prevent us substituting a one-dimensional representation – time as a line in space – for the full experience that is understood only through our embodied intercourse with the world as it *presences*. Space, too, is reduced to the world's two-dimensional representation – as if projected on a screen. We are so used to giving in to this virtualising and distorting process that we don't even notice that we are doing it. Since space and time are where we live, that is a pretty important fact: I will have much more to say about that in Part III of the book.

If the hemispheres generate different worlds, one that broadly presences and one that is effectively represented, this has consequences for the attempt to make sense of the world, otherwise known as philosophy.

TRUTH: AS A THING OR AS A PROCESS?

From everything we know about the hemispheres, we would expect that, in the left hemisphere's world, truth would be conceived as a thing, rather than a process. (It might be abstract – indeed it would have to be abstract, since that is how the left hemisphere deals with the world – but it would still be the abstraction of a thing.)

Truth, this thing, would be conceived of as existing in the realm of subjectivity (in the mind) as a suitable representation of something conceived of as existing in a realm of objectivity (outside the mind). From this point of view, the way to approach truth would be to start with a secure set of facts, and then work upwards by rules of logic, to a series of other facts, putting one secured item on top of another, to build the pyramid of (represented) truth. In principle, this truth would be impersonal, something that could be transmitted, as it stands, directly to another; timeless and unchanging – and independent therefore of context; ultimately single, in that if the path is rigorously followed, everyone should reach the same conclusion; and ultimately perfect, precise and certain – theoretically attainable goals that are *not yet* achieved, so the argument would go, only because we have not yet concluded our deliberations.

Note the words 'representation', 'fact', 'perfect', 'precise', 'certain', 'concluded'. What do these words have in common?

They all suggest a process that has now stopped. Something that *was*. Motion, time, flow are replaced by stasis, eternity and fixity. Look at the lineage of the words. (I accept, of course, that words change their meaning over time. However, through etymology they disclose to us the patterns of thought that lie at the foundations of our culture and are built into the history of our ideas. As familiar, by now – and as invisible – as the air we breathe, we no longer recognise them for what they are.)

All these words come from Latin roots:

- *Representation* speaks for itself. The word *present* comes from the present participle *præsens* of *præ-esse*, meaning 'to be there in front of' (the speaker). *Re-presentation*, then, is the attempt to

make something appear ‘in front of’ the subject *again*, after the fact: something that is by definition no longer actually there.

- *Fact* is from *factus*, past participle of the verb *facere* ‘to do’ or ‘to make’, and it means a ‘something that has been done (or made)’ – and is now in the past, and no longer there.
- *Perfect* is from *per-fectus*, another past participle of a similar root, *per-facere*, by adding the prefix *per-*, meaning ‘through’: to do (or make) completely or thoroughly (or, as we used to say, ‘thoroughly’) – thus what is perfect is ‘that which has been done through to completion’.
- *Precise*, as mentioned, is from *præ-*, before, + *cisus*, cut, past participle of *præ-cidere*: literally ‘having been cut off before its time’.
- *Certain* comes from *certus*, originally the past participle of *cernere*, to decide or determine; ‘something that has been determined’.
- And *concluded* is from *con-*[intensifier], + *claudere*, to shut – to ‘shut off’ or ‘lock up’ completely.

My point is not a narrowly grammatical one, that they mainly derive from past tense formations – after all, even the word ‘process’ comes from a Latin past participle. My point is, rather, the intrinsically completed nature of the idea in every case, which the grammar naturally reflects. A ‘process’ is not generally completed at the moment it is alluded to, but is temporally open: it may be continuous, and ever more coming into being. A ‘fact’ is, however, intrinsically finished, or ‘established’, as we say – which means standing firm (cf ‘stable’), unmoving, where it is. A fact is a thing, not a process.

While this view of the world, which characterises the left hemisphere, allows for the possibility of change, that change has to be accomplished by a series of, in themselves static, steps – not a flow. It is the substitution of one, in principle, fixed, static ‘fact’ by another, like the succession of static stills that produce the effect of motion in a ciné film – until the final ‘facts’ are reached. And then the film ends.

So, how would the right hemisphere conceive truth? Rather than conceiving it as a thing, it would experience it as a process, one that, in this case – not just for now, but in principle – has no ending. More importantly,

it would see that truth is a *relationship*. Instead of seeing a subjective realm and an objective realm which should as near as possible mirror one another, it would see a constant *reverberation* between two (never completely distinct) elements within our consciousness – thoughts and experiences – whereby they ‘*answered*’, or co-responded to, one another; this ever better *accord*, or *attunement*, would *be* the evolving truth. It would be intrinsically incomplete, but constantly in the process of completing itself; and uncertain, though constantly approaching nearer to certainty; incapable of being grasped except through embodied being, through a consciousness that is in the flesh and *engaged* in the world. We would find out what was true only by testing it on the pulse of experience – whether it corresponded with the totality of our experience, not just with one (cognitive) part of it. Because of this it would be unique and necessarily many-stranded.

Please note, nothing about this right hemisphere view suggests that the pursuit of truth becomes pointless – on the contrary, it is demanded. This is not an invitation to give up on something difficult: rather it summons a disciplined attentiveness and an open and active receptivity to the task. Agreement, common ground, can still be, and needs to be, reached, because experience of the world is not random. Truth is emphatically not a free-for-all, a matter of individual whim. Many things – most of the really important things in our lives – can never be proved, but are nonetheless far from being a matter of ‘anything goes’. Here Ricoeur comes to mind:

If it is true that there is always more than one way of construing a text, it is not true that all interpretations are equal ... The text is a limited field of possible constructions. The logic of validation allows us to move between the two limits of dogmatism and scepticism. It is always possible to argue for or against an interpretation, to confront interpretations, to arbitrate between them, and to seek for an agreement, even if this agreement remains beyond our reach.⁶

We cannot force an opinion about what is good or beautiful on someone who is not prepared to accept it. Yet, as Edmund Burke noted, there is more likelihood of agreement in such judgments than in reasoned argument:

There is rather less difference upon matters of taste among mankind, than upon most of those which depend upon the naked reason ... men are far better agreed on the excellence of a description in Virgil, than on the truth or falsehood of a theory of Aristotle.⁷

Returning to my description of how the right hemisphere might conceive truth, note the words: ‘reverberation’, ‘answer’, ‘accord’, ‘attunement’, ‘engagement’. In contrast to what we saw earlier, they involve motion, reciprocity, energy.

- *Reverberation* comes from Latin *re-*, again, + *verberare*, to beat, meaning ‘the return of a beat’.
- *Answer* comes from Teutonic roots *and*, + *swara*, and means affirming (as in ‘swearing’) something in *reply* (the force of the old Teutonic word, *and*).
- *Accord* comes from Latin *con-cordare*, from *cor*, the heart: literally ‘to bring heart to heart’.
- *Attunement* means to bring the tune or ‘tone’ of one thing towards (*ad*+) another – the word ‘tone’ itself coming from Latin *tonus*, a ‘stretching, or tension’.
- *Engagement* means a ‘pledge’ or sworn agreement (as in what comes before marriage), from Old French *gage*, something of value given in exchange for action (in its Teutonic form, it is related to the word ‘wed’).

And that leads one to the meaning of the word *truth* itself.

We now tend to think of truth as a matter of propositions. The word ‘truth’ in its origin indicates not a proposition, but a disposition. ‘True’ (cf German *treu*, faithful) is related to ‘trust,’ and is fundamentally a matter of what one believes to be the case. Truth and trust (belief) go together. One cannot have trust in a society where there is no truth; and one cannot be true to a society in which there is no trust. That is of fundamental importance, since, as Confucius told his disciple Tzu-kung, for a stable society a ruler needs three things: weapons, food and trust. If he cannot hold all three, he should forgo weapons first, and food next; for ‘without trust we cannot stand’.⁸

The Latin word *verum* (true) is cognate with a Sanskrit word meaning to choose or believe: like one's loved one, the one in whom one chooses to believe and place one's trust, to whom one is 'true'. We used to speak of plighting one's 'troth' (an older form of the word 'truth'). And we still speak of two surfaces that 'marry' well as being 'true'. They meet and therefore are 'meet'; they fit and therefore are 'fit'. It is a matter of fit – and fidelity.

Belief too is about fidelity (Latin *fides*, faith). The word 'belief' has nowhere buried in it the idea of signing up to a proposition, certain or uncertain. It is not a matter of cognition, but of recognition. The word belief comes from the same root as the word 'love', a sense preserved in the now archaic word 'lief', familiar to us from Shakespeare, with which one once described one's friend, sweetheart, or lord – someone in whom one believed. Similar considerations apply to the German *glauben* (related to *lieben*, to love), and to the French *croire* and other derivatives of Latin *credere*, a word which meant originally to 'entrust to the care of' (the sense lingers, in reduced fashion, in the idea of 'credit'), and originally to 'give your heart to' (possibly from Latin *cor do*; certainly involving Proto-Indo-European root *kerd*, heart). Belief is about a relationship, in which by definition, more than one party is involved. The believer needs to be disposed to love, but the believed-in needs to inspire another's belief or trust. Whether this amounts to being worthy of that belief cannot be fully determined in advance. It emerges only through commitment and experience.

Etymology is hugely revealing. Slippages in meaning tell us about the direction in which we may have drifted without even being aware of the drift, much as rifts in the bedrock speak to us of continental drifts that made the landscape in which we live, but which we cannot perceive. The left hemisphere regards words as tokens that can be manipulated to mean what we like, not living, embodied signs, with a history. That way danger lies: so-called 'post-truth' being one. I repeat, I am not trying to rewrite the meaning of words, but precisely the opposite: in an age when language has become deracinated (which literally means, like a flower uprooted) from its embeddedness in a community of human beings, I am merely showing how we have got where we are now. History is always relevant, because life is not a series of moments, but a continuous flow. One of the most ignorant remarks ever made, representing the machine world view for which we are

now paying, and will continue to pay, a very high price, is Henry Ford's 'history is bunk'.

Be that as it may, I think it possible that some of the disagreements in the debate about truth start with these broad differences in whether we see 'truth-as-correctness', a thing that can be determined, and into which nothing of us enters; or 'truth-as-unconcealing', a process of something revealing itself to us only through our experience. (Heidegger often used the Greek word for truth, *aletheia*, which literally means 'un-forgetting', allowing something to emerge from oblivion.)

How do we decide which way of conceiving truth is truer?

First, notice that a process, unlike a thing, suggests the importance of not just the whatness, but the howness. There are no deep truths that are separate from the manner in which they are expressed. As the philosopher Friedrich Waismann puts it:

If you ever try to put some rare and subtle experience, or a half forgotten impression, into words, you'll find that truth is intrinsically tied up with the style of your expression: it needs no less than a poet to render fully and faithfully such fragile states of mind.⁹

Which is why we honour poetry as a path to truth. As I will argue, the most fundamental truths, of both a physical and psychical nature, can ultimately be expressed only in terms of poetry. And Waismann points out that the meaning of the word *truth* differs with context, so that it has 'a *systematic ambiguity*', as have deceptively simple sounding words such as *fact*, *statement*, *knowledge*, *law* and many others.¹⁰

WHO CORRESPONDS WITH WHAT?

There are a number of conventional ‘families’ of approach to truth. I can’t pretend to do justice to the subtle disputations on this theme that have occupied some of the cleverest minds in history (some such disputations, nonetheless, especially in the last century, being more notable for the heat, than the light, they generated, at least in my view). What I offer in the rest of this short chapter are some elementary reflections on the main ways in which truth has been regarded, the bare minimum necessary to act as an introduction to the next few chapters, in which I will discuss the possible *paths to truth*.

The idea of truth always implies *some* sort of correspondence. One major strand in thinking over the centuries is, indeed, known as ‘correspondence theory’: that truth lies in a correspondence between what goes on in our minds and a mind-independent reality. The closer the two come, the more we can speak of truth. According to such a view, understanding is the forging of links between symbols in the mind and that reality, such that it is accurately represented internally. This is intuitively appealing. But, since according to this view we have no direct contact with reality, and we cannot know anything except as we know it, how, according to this view, could we know whether our knowledge is true to what is ‘out there’, before the very fact of our knowledge of it has been substituted for it? Is there, in fact, such a thing as a world that just simply is ‘out there’ – wholly mind-independent – at all? Does this not already set up the left hemisphere’s idea that all we experience is a re-presentation?

The classical counterpoint to correspondence theory is ‘coherence theory’: that truth lies in the cohesion of what it is that goes on in our minds. If something coheres with – and, moreover, mutually sustains – other things that we hold to be true, it may be regarded as itself true. Otherwise it is false. Here there is still a correspondence, but it is not between what ‘goes on in here’ and what ‘goes on out there’, but between the elements that ‘go on in here’.

Coherence also has an intuitive appeal, but has its own problems. A whole set of beliefs could be mutually coherent and entirely false: everything depends on where you start from. How are we to judge the best

place to start? If we believe the world is flat, we can hold a myriad of ideas that are coherent with that – but wrong. What's more, why do we suppose that truths may not conflict? Opposites may both be true. It's possible, I agree, to have amongst your beliefs an overarching belief that contradictory statements may both be true, but this seriously undermines the usefulness of coherence as a criterion of truth.

As the philosopher Anthony Quinton pointed out, a solution that involved the 'close interweaving of the correspondence and coherence theories' would be progress, and would 'explain why the conflict between them has continued for so long'.¹¹ I will discuss shortly, a way in which I believe something like this hoped for rapprochement can be realised.

There exist, naturally, further possibilities. 'Consensus' theory holds that what is true is what is generally accepted to be the case. The correspondence here is between the views of different individuals. This is beguiling, but hardly convincing. For one thing, if people generally held consensus theory to be false, and many people do, it would be a non-starter, because it would be itself untrue. Leaving that aside, how would one determine in practice the outcome of a potentially infinite series of referenda? Moreover, fairly obviously, the majority can be mistaken: the world is not flat, though at one time the majority may have thought it to be so. And how could any new truths be discoverable? At the outset almost everyone would consider them false – and they would therefore have to *be* false.

There are a number of 'deflationist' – or in my view, more accurately, defeatist – versions of truth. One holds that the whole idea of truth adds nothing to a linguistic assertion that something or other is the case, and should therefore be abandoned. 'Relativist' versions suggest that, since there is no one clear truth, everything being context-dependent, once again the whole idea of truth needs to be abandoned, each of us having our own truth. 'Social constructivism', at least in its strong version, suggests that truth is simply fabricated by society, being in effect what that society holds to be true – an invention that, according to some, is used by a powerful elite to disenfranchise others.

I suggest that both the disappointed hopes for truth here, and the rejections of all hope for truth here, are equally mistaken, and equally based on a belief in truth as a thing: 'truth-as-correctness'. This is what I have suggested is the left hemisphere's path. And we see classic left hemisphere

characteristics: fear of uncertainty, coupled with its black and white ('either/or') manner of conceiving the world, playing an unhelpful role: either truth is certain (at least in principle, even if we never attain it, as in science), or it doesn't exist. Or at any rate, if it does exist, it can't be of any use. Remember the left hemisphere's *raison d'être* is utility in the service of manipulation. If the matter can't be usefully demonstrated in such a way that it compels a conclusion – if it is in other words, no longer *coercive* – it has no use, no 'function'.

It might be pointed out, however, that two thousand years of insistence, in the West, on the idea of truth as single, timeless and correct has demonstrated only how multiple, contingent and fallible it seems to be, since it has notably failed to coerce the wisdom of philosophers to any one point of view. The ambition of being able finally to demonstrate truth to someone incapable of seeing, or determined not to see, what one means is a complete waste of time. Why should truth have a coercive quality?¹² Truth might be more a matter of something to which we are drawn freely as it were 'from in front' – attracted – rather than compelled inevitably 'from behind' – pushed. Very little that we take for granted as most essential to life – love, energy, matter, consciousness – can be convincingly argued about, or even *described*, without becoming ultimately self-referential. You have to experience it to know it: all we can do is point.

Correspondence theory founders on the unworkable idea that we could know what something is like when we are not knowing it. And all the alternatives compel in one way or another the conclusion that we are like prisoners in a cell, with no window giving directly on the world: it is implicitly assumed that, because we can't know a reality without 'our knowing it' entering into the equation, therefore we can't know reality. As a result, what we decide to be true must be determined by our own minds, as we discuss amongst ourselves what reports we have of where we are and what we know. It's just what makes sense linguistically in relation to how we act. If our image hangs together internally, or is generally agreed to be the case, or makes linguistic sense, that's the best we can hope for. And according to the other theorists truth is not a helpful concept anyway and should be abandoned.

STICKING WITH THE CONCEPT OF TRUTH

I wouldn't give up on truth that easily. After all, truth may rarely be pure and never simple, but it sure as hell exists – even if one sign that we were certainly deluded would be certainty that we were in possession of it. Uncertainty here is not a sign of failure, but lies deep in the nature of what we are trying to grasp. Truth is uncertain not because it is *empty*, but because it is *full* – rich, complex, manifold. (This is related to what I believe to be the mistaken assumption that because we cannot pin down the 'meaning' of the world in which we live, it *has* no meaning: I will argue that this experience comes not from there being no meaning, but from there being a plenitude of meaning, beyond simple articulation.) Some postmodernists leap from the uncertainty of truth to its non-existence, but this assertion is open to the obvious rebuttal that it is a truth statement, which asserts that the assertion that 'there is no truth' is truer than its opposite, that 'truth exists'. If we seriously doubted the *existence* of truth, none of us would get out of bed in the morning, because there would be no point in preferring any one course of action to any other. There'd certainly be no point in writing, or reading, a book. No philosopher that ever lived, whatever his professed creed, behaved as if there were no truth.

But why assume that our experience is not what it seems to be, that is to say direct and real? Open to only a small part of reality, of course, but nonetheless real for that. Just because we midwife it into being, and just because we can never see it whole, it doesn't follow that the world we know is a fantasy.

What I propose here combines elements of the thinking of the American Pragmatists (James, Peirce and Dewey) on the one hand and of the European phenomenologists (particularly Merleau-Ponty, Scheler and Heidegger) on the other, but it would be wrong of me to try to annex their names – and their far from mutually agreed ideas – to my simple reflections. I mention it in case someone should think I am not aware of my intellectual debts.

If we place the emphasis on truth as a relationship, which is where we started, rather than as a 'thing', certain aspects become apparent. In a relationship, both parties count, and the relationship isn't a separate 'thing',

but contains both parties that constitute it. It doesn't lie in one or the other alone. This means that it is necessarily lived; changing and contextual. But it is none the less real for that: on the contrary, it is maximally real precisely *because* of that. It is also something deeply rooted in experience. It doesn't matter what the theory dictates, if it doesn't 'answer' in practice. The proof of the pudding is in the eating. So the Pragmatists such as William James believed. 'The benefit of holding true beliefs, according to James, is that if what one believes is true one is, so to speak, guaranteed against recalcitrance on the part of experience', writes the philosopher Susan Haack. 'No doubt one could get along perfectly well, for a bit, holding false beliefs; but, James thinks, one would eventually be caught out.'¹³ Wittgenstein learnt a great deal from William James and his later work is arguably Pragmatist in style.¹⁴ According to one of his pupils, 'Wittgenstein very frequently referred to James in his lectures, even making on one occasion – to everybody's astonishment– a precise reference to a page-number! At one time, furthermore, James's *Principles* was the only philosophical work visible on his bookshelves.'¹⁵

I should say right away that Pragmatism is not the same as being pragmatic, just believing 'whatever works' to be true, because, as long as the context is carefully defined, almost any view can be said to 'work', even if clearly false. Treating people as objects 'works' if your aim is to be as efficient as possible in sending them to the gas chamber. Treating nature as a heap of resource 'works' if your aim is to make plastic as cheaply as you can. Treating a cell as a machine 'works' if your aim is to find a lock and key mechanism for changing its function. But people are not objects, nature is not a heap of resource, and, as I shall later explain, a cell is not a machine. In a less narrow context each of these 'truths' breaks down. Eventually – or rather quickly – we are, as Haack puts it, caught out. These modes of thinking do not truly answer to our experience at all. Thus, while pragmatic, they are not Pragmatist.¹⁶ Pragmatism is a form of open-mindedness that judges ideas not by their roots but by their fruits.¹⁷

We should be used to this idea of truth and falsehood, because we are constantly confronting the fact that the world does *not* confirm our modern Western 'take' on it. It doesn't respond, or correspond, to our fantasies. Yet we behave as though our theories about reality were more important than what experience keeps telling us. This is consonant with our world view being skewed towards that of the left hemisphere. Both hemispheres need to

update what they know of the world in the light of experience, and the right hemisphere tends to make changes to its ‘version’ as it gathers information from experience. The left hemisphere, however, tends to stick to its theory in the face of disconfirming evidence. This has been repeatedly demonstrated.¹⁸

As usual it is not a matter of the right hemisphere versus the left hemisphere in the sense that one must be right and the other wrong, but the need for a judicious harmonising of them both. Each has its place. Nothing needs to be ruled out in the relationship between the hemispheres. But, as always, *they are not symmetrical in value*.

Let me suggest an analogy. Newtonian mechanics is at one level incompatible with quantum mechanics. It does useful work at the level of day-to-day reality, but at the subatomic level, or at the cosmological level, it no longer applies. But it is not that quantum mechanics applies only at the extremes of magnitude, and Newtonian mechanics, which contradicts it, applies only in the bit in the middle where we normally focus. That would be like saying the earth is curved elsewhere, but flat wherever we happen to be. It’s always curved: just for everyday purposes it looks flat, and we don’t need to take the curve into account. Similarly, quantum mechanics applies across the whole field; Newtonian mechanics is just a handy approximation that can be overlaid on quantum mechanics for *practical purposes*, provided it is restricted to the day-to-day level. It won’t help us understand the underlying reality – in fact it misleads us there. But it has its own, prodigious, usefulness.

Note that it is the precision of Newtonian mechanics that makes it a less good fit, while the intrinsically less precise quantum mechanics is more accurate. I am reminded of the way in which template-driven ‘packages of care’, now enjoined as good practice by managers of our healthcare system, are always, despite their crispness, a poor fit to the individual case because general, and precise – whereas the fuzzier, personally tailored response is a much better fit, because individual, and accurate.

A further etymological observation: ‘accurate’ derives from Latin roots *ad-* + *curare*, ‘to exhibit care towards’.

Precision and accuracy are often confused. It is said that a curator at the Natural History Museum was intrigued to hear one of the attendants telling an impressed party of tourists that a dinosaur skeleton was 9 million and 6 years old. When the curator later asked how the attendant knew, he received

the reply: ‘Well, it was 9 million years old when I started working here, and that was six years ago...’ More precise, but less accurate.

Newtonian mechanics is more precise, though less accurate. Our lives would be practically impossible without it. Its contribution is *necessary*. We need its limiting, clarifying logic. Yet it is not of equal status with quantum mechanics when it comes to the disclosure of reality.

So it is with the complementary nature of the contributions of left and right hemispheres: the first is *as necessary as* the second, but not as capable of disclosing reality. Its vision is limited, clear-cut, handy for the everyday. More precise, but less accurate.

Philosophical and cultural disputes often founder on the misunderstanding of opposition (as in this case of the left hemisphere and the right hemisphere). If it is seen as a matter of ‘either/or’, in which one is triumphant and the other destroyed, opposition is misunderstood. But this is already the standpoint of only one hemisphere – the left hemisphere as opposed to the right. Adversaries can both be ‘good’ to and for one another because of their very opposition, which enables each to be more itself, and additionally allows something quite new to arise from their conjunction. In any case, whether we like it or not, they are mutually necessary. Opposites are not to be resolved by eliminating the one we happen to dislike, any more than lopping off the south end of a bar magnet gets rid of the south pole: it just shortens the magnet.

THE 'SUBJECT-OBJECT DIVIDE' AND WHERE THAT LEAVES THE CONCEPT OF OBJECTIVITY

Since this matter of the relation between opposites is going to recur, let me say something of the troublesome subject-object divide, since it is in general relevant to the nature of truth.

A representation is by definition removed from the immediacy of what it re-presents. It thus creates the question, what is the relation between the representation and that which it represents – that which *presences*? This is the left hemisphere's problem, because it is the hemisphere of representation. The hall of mirrors makes the reality of what exists outside that endless circle of reflections problematic. How does the subjective (the world inside the hall of mirrors) relate to the objective (whatever exists outside it)? But this question does not arise for the right hemisphere. What is present to the right hemisphere is just that: *present*, in the very moment of our experience, in our *comprehension* of it, not before, after, or as a consequence of, something 'in here' that now has to be related to something 'out there'. It is a single experience.

It is said that Bashō told a disciple that the problem with most poems was that they were either subjective or objective. The student said, 'You mean too subjective or too objective?' Bashō's reply in full was, 'No'.

Another way to view the problem is to distinguish the right hemisphere's view of what we call opposites from the left hemisphere's view. To see just how misleading the subject-object divide is, one does not need to go to spiritual sages or theoretical physicists, though either would be able to give a much richer and deeper account than the one I can give here. (I will explore their views further in Part III.) For now, let me merely quote one representative passage from Schrödinger:

It is the same elements that go to compose my mind and the world ... The world is given to me only once, not one existing and one perceived. Subject and object are only one. The barrier between them cannot be said to have broken down as a result of recent experience in the physical sciences, for this barrier does not exist.¹⁹

The problem arises because we jump from an awareness of a distinction to the assumption of a division. The poles of a magnet are clearly distinguishable but are not divided; indeed they are interdependent, mutually necessary, ultimately indivisible parts of the same whole. The most immediately concrete way of understanding this non-dichotomy is in human relationships. A good relationship is one in which each party is maximally fulfilled as a differentiated individual, without this in any way detracting from the relationship, but rather being a condition of the possibility of a good relationship at all – and indeed also a consequence of such a relationship. Equally, we are not atomistic, and cannot be ‘ourselves’, whatever that would mean, in a cultural or societal vacuum. Thus a good society is not one in which individuality is lost, but one in which it is fulfilled; yet, at the same time, that individuality must not be a threat to the cohesion of the society. There is such a thing as tyranny of individuals over society, as well as society over individuals.

That may seem a considerable way from any consideration of the objectivist position, but it is not as far as it seems. Take a step closer and look at the development of an individual. What has to be negotiated by every child that matures successfully into a human adult is the separation from his or her early state of fusion with the mother, to one in which he or she is aware of being a distinct person, separate from the mother, yet without the close connexion with her being lost; and, through her, connexion with the rest of the experienced world. This is not a matter of a change of quantity (*more or less* connexion), but a change of quality in the connexion: equally (arguably more) connected, but now in a different way.

We can have no knowledge of the world without our consciousness being part of that knowledge, which means that whatever our knowledge is, it has a lot of us about it, beginning with whatever it is we mean by knowledge, and the ‘having’ of it, at all. Then there are all the preconceptions – and pre-perceptions – that go to constituting what we can know in any one particular instance. According to a position that would be supported by some contemporary physicists as well as philosophers in many traditions, both Eastern and Western, consciousness is, in any case, the primary stuff (at least *a* primary stuff) of the universe, in which case the idea of a realm apart from mind is strictly meaningless; but we do not have to go that far in order to be obliged to accept the point that we can’t hope for ‘objectivity’ in the sense of starting from a blank slate. The alternative

is, however, absolutely not a free-for-all, in which we make up whatever we like and call it truth. If the concept of objectivity is mistaken, the striving for truth that lies behind it is still not only honourable and worthwhile, but absolutely essential.

In practice, if not in theory, we can recognise what is required. It is not the adoption of a dehumanising stare, one which reduces living things to objects. It is not even disengagement, since disengagement radically alters what we can see, and there is no logical reason why what is disclosed to us by disengagement should be preferred to what is disclosed to us only by engagement – though it depends, crucially, on the nature and quality of that engagement. In a famous passage, David Hume writes:

I dine, I play a game of backgammon, I converse, and am merry with my friends; and when after three or four hours' amusement, I would return to these [his philosophical] speculations, they appear so cold, and strained, and ridiculous, that I cannot find in my heart to enter into them any farther.²⁰

The implication is not that his post-prandial view is right or wrong – it is merely different and must lack something (because it misses something that was real enough), even if it gains something (because it now sees something that is also true).

The philosopher Michael Polányi, speaking of the reappraisal of man's place in the universe after Copernicus, writes that we have been enjoined 'resolutely and repeatedly' to abandon our egoistic point of view, and 'see ourselves objectively in the true perspective of time and space'. But 'what precisely does this mean?', he asks.

In a full 'main feature' film, recapitulating faithfully the complete history of the universe, the rise of human beings from the first beginnings of man to the achievements of the twentieth century would flash by in a single second. Alternatively, if we decided to examine the universe objectively in the sense of paying equal attention to portions of equal mass, this would result in a lifelong preoccupation with interstellar dust, relieved only at brief intervals by a survey of incandescent masses of hydrogen – not in a thousand

million lifetimes would the turn come to give man even a second's notice. It goes without saying that no one – scientists included – looks at the universe in this way, whatever lip-service is given to 'objectivity'. Nor should this surprise us. For, as human beings, we must inevitably see the universe from a centre lying within ourselves and speak about it in terms of a human language shaped by the exigencies of human intercourse. Any attempt rigorously to eliminate our human perspective from our picture of the world must lead to absurdity.²¹

All the same, we could make an imaginative attempt to stand aside from our usual viewpoint. Indeed, one of the crucial functions of the imagination is to enable us to take various perspectives on the world: it enables us to 'see how it looks from over there'. This encourages a certain humility about how it looks from one's own perspective, and yet at the same time provides some reason for confidence in what one takes to be the case. Without imagination there can be no objectivity.

Well, I will need to return to this question in different forms at different points in the book.

OPPOSITION: 'EITHER/OR' AND/OR 'BOTH/AND'

Returning to the problem of the misconception of the relationship of the hemispheres as oppositional, this is as simple as whether one takes a left hemisphere, or right hemisphere, view of opposition: one point of view, that of the primarily analytic left hemisphere, is exclusive ('either/or'), while the other, that of the primarily synthetic right hemisphere, is inclusive ('both/and'). Since this is their disposition in general, it also applies to their relationship in particular. To recall the primary myth of the Master (RH) and his emissary (LH), the Master knows he needs the emissary, while the emissary does not know that he needs the Master. The tendency is for the one that sees less (the emissary) to believe that he sees all, while the one that sees more (the Master) sees there are things he doesn't know; just as those who think they know it all know less than those who know they do not.²² To the extent that there is a 'war' here, it is of the left hemisphere's making, and stems from its unwarranted self-belief.

The philosopher James Carse makes a distinction that is relevant to understanding the difference between the viewpoints of the two hemispheres. 'There are at least two kinds of games', he writes. 'One could be called finite, the other infinite. A finite game is played for the purpose of winning, an infinite game for the purpose of continuing the play.'²³ The first emphasises an outcome that closes down the process. The second emphasises the process, which *is itself* the desired outcome.

One of the hemispheric approaches, that of the left hemisphere, aims to close down on truth. The game lasts, while it does so, only because the longed for close-down has not yet happened. Once it has, the game is over.

The other, that of the right hemisphere, aims to open up to truth, and sees the truth as a never-finished seeking after, and evolving of, something that is disclosed *by the very process*, which the 'game' of life continues.

So it is that one mode of truth is first formulated theoretically, abstractly, conceptually; and then tested, if at all, only afterwards. Meanwhile the other is constantly tested during its formulation – in the process of becoming truth. One is like planning out a journey on the kitchen table in advance; the other like feeling one's way – testing or tasting, through touch and tact – forwards on the journey. It is wise not to do

without either approach, though if you have to forsake one, the first, never the second, is the one to let go.

We each of us know only our experience, of course, so there is no reason to believe that there should be a way of making truth coercive. What does my experience tell me? That I am strongly seduced by the assurances of the left hemisphere. They appeal to my desire to know, at last – to be *sure*: to construct an argument, to feel confident that I can persuade people that I have something worthwhile to say; to use argumentation to reach, finally, a conclusion. Yet I am also aware that this approach, important as it is, lacks something, when contrasted with what the living of a life tells me. Truth is an encounter: it needs to be ‘felt in the blood and felt along the heart’, in Wordsworth’s famous phrase. But – this is the crucial point – although it can never be demonstrated in such a way as to coerce consent, consent is nonetheless not only possible, but likely, as long as people are being honest with themselves. The problem as always comes from an attempt to be rigid, a left hemisphere demand that inevitably distorts a reality that is in no respect rigid. We can’t have correctness, we can only have a maximally attentive, maximally open, testing out of our ideas on the world as we experience it.

Thus, when one speaks truth, one hopes that people will agree, but they can always find reasons not to agree if they are determined enough not to hear. ‘That’s just your opinion’, people say, with the implication that ‘my opinion is as good as yours’. And, undoubtedly, it may be – or it may not. That is the point: there *is* still a structure of better and worse, even where better or worse cannot be finally demonstrated so as to avoid dissent. We have become accustomed, in our Western way, to see all exchange of ideas as a kind of battleground in which there will be conquest and defeat. In the East, ancient truths have not commonly been thought such that they can convince (the word comes from Latin *vincere*, to conquer) through argument, but rather that they become appreciated (the word comes from Latin *pretium*, value) through a patient, disciplined opening up of the self to experience. Jan Zwicky puts it like this:

Truth is the asymptotic limit of sensitive attempts to be responsible to our actual experience of the world ... ‘sensitive attempts to be responsible’ means truth is the result of *attention*. (As opposed to inspection.) Of looking informed by love. Of really looking.²⁴

Attention, once again, is the key to what we find; and note that Zwicky refers to a particular kind of attention, looking that is informed by love. Therefore informed by a positive engagement and regard, not by trying to experience it in as far as possible a 'non-experiential' way.

I readily accept that there is no cast-iron certainty here, but there isn't any *anywhere*. So let's get over it. There are, however, degrees of truth, some of them very great, and carrying increasing conviction with experience. Though truth is always my personal judgment, it is not just possible, but necessary, that my judgment should take into account yours and many others. It is far from random, but is, rather, informed by experiment, perception, reason, intuition and imagination. That doesn't make it less reliable than being informed by a single source, such as reason, might have done, but more reliable. Acquiring a degree of judgment that can make these elements intelligently cohere is – or used to be – the whole purpose of education. It is why we study the humanities. What history and classics and literature tell us is not to be found in the sciences anywhere. Nowadays we seem to have forgotten this crucial insight, on which the future of our civilisation nonetheless hangs. Judgment used to be the foundation of the idea of reasonableness – a concept you may remember, but which we are in danger of losing, if we have not already done so, in a mechanised, bureaucratic society. The popular reaction to this has been only to intensify the mechanistic vision: no longer seeing complex, unique individuals but only representatives of groups, no longer open to appropriately nuanced, but simple 'I'm right, you're wrong' positions, and shouting more and more loudly. Reasonableness is as far from unbridled emotion as it is from rote rationality, on the worst excesses of which it acts as a much-needed brake.

PORCUPINES AND MONKEYS

As to which model of truth seems more truthful, the best guide will be experience. But are there any grounds, purely in the neuroscience of hemisphere difference, that could help guide our choice? I think there are. In Part I we have already seen that the right hemisphere ‘sees’ and understands more.

These days I am often reminded of a story by Yuri Tynyanov, called *Lieutenant Kizhe*, published in the Soviet Union in 1927. It concerns a mis-transcription of a record in the Tsarist army, whereby someone mistakenly adds a redundant syllable (*zhe*) to the end of the word *poruchiki* (lieutenants), and in doing so creates a ‘Poruchik Kizhe’, a Lieutenant Kizhe – who doesn’t exist. Despite this handicap, Kizhe pursues a distinguished career: he is promoted through the ranks, where he is known for his dependability, marries, fathers a child, is decorated for bravery and is finally promoted by the Tsar to the rank of General. When the Tsar asks to meet this human paragon, Kizhe mysteriously cannot be found. The Tsar, informed that he is dead, is overcome with emotion, and orders the good soldier Kizhe a state funeral. Meanwhile one Lieutenant Sinyukhaev, who was left off the records by mistake, cannot convince anyone that, contrary to report, he is very much alive, and is forced to wander the highways of Russia, relying on the charity of strangers.

This is, of course, a thinly veiled satire on life in Soviet Russia – amusing, you might think, but far-fetched. However, as has often been noted by satirists, reality soon outstrips our attempts at satire. A correspondent reported to me the following real-life incident involving an American friend, who was told that her brother had died in an explosion.

She rushed to the hospital and was taken to the morgue to identify the body. It was indeed her brother. She bent to kiss him on the forehead and felt that he was still slightly warm, although the body had been refrigerated. She felt his hand and thought she detected an infrequent pulse. Amazed and alarmed, she called for a nurse. This nurse felt the body briefly and agreed that it was indeed still warm, but commented, ‘That’s odd, but you needn’t worry about it, dear, because it says here on this chart quite clearly that he’s dead’. This pronouncement delivered, the nurse calmly walked away. The

friend ran into the corridor, and frantically grabbed a passing doctor, who assessed the situation, gave her brother intracardiac adrenalin, and successfully resuscitated him. He still lives.

What, you may ask, has that got to do with hemispheres? Let me explain.

As readers of *The Master and his Emissary* will know, in 1996, in an extraordinary and elegant piece of research, the prominent Anglo-American neurologist Marcel Kinsbourne and a Russian colleague Vadim Deglin conspired to investigate how the two hemispheres of the brain reach conclusions about what is true.²⁵ To say, as they modestly do, that aspects of the results are ‘revealing’ and even ‘remarkable’ is, I believe, an understatement. (I referred obliquely to this experiment in Part I.)

By a procedure that temporarily suppresses one hemisphere at a time, they were able to ask the two halves of one and the same individual’s brain the same questions and compare the answers they received.²⁶ This gave them a window, just for about 15 minutes, into each hemisphere’s world. And what they asked was simply whether the conclusion of each of five syllogisms was true. How controversial could that be?

A syllogism is a logical structure whereby two propositions (or ‘premisses’) taken together lead inevitably to a conclusion. The classic example is:

1. All men are mortal;
2. Socrates is a man;
- therefore:
3. Socrates is mortal.

We can imagine this formulated as a question: ‘Given 1 and 2, is Socrates mortal or not?’ The answer is obviously ‘Yes, he is.’ This is the way Deglin and Kinsbourne configured their investigation. In the experimental examples, however, there was a cunning twist. In each syllogism, one of the premisses was false. So was the conclusion true, or not?

Here’s an example:

1. All monkeys climb trees [so far so good];

2. The porcupine is a monkey [not so good];
3. The porcupine climbs trees.

Is this true? As you can see, the issue is not quite straightforward. So how would you answer?

(Between you and me, there are, annoyingly, porcupines that climb trees. So before someone points it out, I should say that this fact was clearly not known to the investigators or their Russian subjects, and for the present purposes we can put that out of our minds.)

The point at stake is one that is familiar in Western thinking since Aristotle: between a *valid* argument and a *sound* one. An argument is said to be valid if its logical structure, as here, is correct. It is only said to be sound if *both* the structure *and* the premisses are correct, which here one of them clearly is not.

The experiment was carried out using the same five test syllogisms on 10 different subjects, each three times over, first in the normal state and then with just one hemisphere functioning at a time, yielding 150 results overall. And as we can glean from those results, it is clear how most of us normally answer. We normally reply that the conclusion is false, because, fairly obviously, the porcupine is not a monkey.

But what happens when we take one hemisphere on its own?

When the right hemisphere alone is asked, it replies, with some indignation, that the porcupine is ‘not a monkey, it’s prickly like a hedgehog, it is wrong here!’ However, when the isolated left hemisphere alone is asked, ‘the same subjects changed their answers dramatically’.

As the authors point out, the subject’s ‘*attitude to false premises* changed radically’. When the left hemisphere of the very same individual, the one that has previously given the indignant response, is asked if the conclusion is true, it replies that, yes, ‘the porcupine climbs trees, *since it is a monkey*’. When asked by the examiner ‘but is the porcupine a monkey?’, the subject replies that she knows it is not. Nonetheless when asked again, she repeats that ‘since the porcupine is a monkey, then it climbs trees’. Again challenged by the examiner – ‘but you do know that a porcupine is not a monkey?’ – she insists on her answer. Why? Because ‘it’s written so on the card’.

Here is another example, from a different subject, using a different syllogism:

1. Winter is cold in tropical countries [untrue];
 2. Ecuador is a tropical country [true];
- question:*
3. Is it cold in winter in Ecuador, or not?

Right hemisphere response:

Subject: [shrugs her shoulders] Winter is not cold in tropical countries! It's a lie!

Left hemisphere response *of the very same individual:*

Subject: [reads quickly and answers immediately] It's cold in winter in Ecuador, because Ecuador is a tropical country.

Examiner: *Oh, is winter really cold in tropical countries?*

Subject: I think so. Winter is cold there and summer is warm.

Examiner: *Are you sure of this?*

Subject: No, I am not.

Examiner: *Ecuador is a tropical country, then, can it be cold there?*

Subject: No, it can't be since it is a tropical country ...
(the same syllogism is presented again):

Subject: It is cold in winter in Ecuador because Ecuador is a tropical country.

Examiner: *But you do know that it is not so.*

Subject: But it is written here.

The results were consistent across the 10 subjects. In fact one subject answered *all* the questions empirically – by reference to real-world knowledge – when in the normal state, as well as when using only her right hemisphere; and answered them *all* formally – according to the internal logic of the system – when using only her left hemisphere.

It is relevant that ‘the right hemisphere ... relates the sign to its referent. For the left hemisphere the relation of the sign to its referent is of less importance than for the right hemisphere; the left hemisphere deals with *the interrelation of signs*.’²⁷ Thus helping us to identify in the thrust of some postmodern philosophy the triumph of the left hemisphere.

As far as the left hemisphere is concerned, truth is fidelity to a closed system which defines its own reality. Internal, theoretical, consistency is more important than truth to experience. The right hemisphere, meanwhile, thinks that it might be worth checking by looking out of the window, where, whatever it may say on the piece of paper, a porcupine is not, actually, a monkey, nor are tropical winters cold.

Note the left hemisphere’s take is not to be confused with ‘coherence’ theory, which implies that a statement is judged true if it coheres with all one’s other beliefs. By that standard the assertion that a porcupine is a monkey cannot be held to be true, nor can anything that flows from it. Nor should the right hemisphere’s take be confused with ‘correspondence’ theory, whereby what the mind conceives is an accurate representation of something outside the mind. It is just much more loyal to truth as something that arises through experience than something asserted by an abstract system, the rules of a (finite) game.

CONCLUSION

In this chapter we have considered not what and how each hemisphere might contribute to the main paths humans have followed in their quest for truth – that will come in subsequent chapters; but how each would see the nature of truth itself. I suggest that the left hemisphere would see it as a *thing*, certain, fixed, and independent of our interaction with it, standing outside time and concerned with the consistency of a representation. By contrast, I suggest that the right hemisphere would see it as a *process*, always contextual, forever coming into being through our present interaction with the world in time, but nonetheless real for that – indeed, real *because* of that, because constantly tested against experience. I believe we often behave as though either truth is as the left hemisphere sees it, or else it does not exist. But, crucially, these are not the only options.

Further, let me emphasise that *both* the views currently on offer in so much public debate today – naïve positivism and naïve deconstructionism – are typical left hemisphere fictions. It is not that the first is left hemisphere-congruent, and the second right hemisphere-congruent. Each is an ill-concealed power grab, completely lacking in subtlety, and devoid of any sense of our true connection with the world. The ‘betweenness’ in which fidelity can operate has been lost: that is only understood properly by the right hemisphere. That there is ultimately no certainty (except in mathematics) is emphatically not an invitation to promulgate your latest theory based on some political ideology: the dangers in this are every bit as great as in adhering too closely to the reductionist materialist picture – possibly greater, since they derive from a position for which every point of view, every statement, is as valid as any other. That brings an end to truth, and hence to civilised discourse: indeed, an end to civilisation. Unfortunately, naïve positivism may ultimately lead there, too.



In Part I of this book I looked at the evidence that each hemisphere is or is not a reliable witness to the truth about reality. I use the term in the Pragmatist sense that, in Susan Haack’s formulation, ‘if what one believes

is true one is, so to speak, guaranteed against recalcitrance on the part of experience'. I was concerned there with the *means* of this kind of truth, the portals through which it can be discerned.

In Part II I will argue that each hemisphere is indispensable to a proper understanding, and that each makes a contribution, though in the modern West we are often misled by the left hemisphere's inveterate tendency to neglect the right hemisphere's contribution and 'go it alone'. I made the analogy between a pilot avoiding a plane crash and a philosopher coming out of his encounter with reality unbruised. In the modern Western world, we are constantly crashing, and puzzled as to why; constantly faced with paradoxical outcomes to our actions, what particle physicist and quantum theorist David Bohm called 'sustained incoherence'. We often find that we strive for something and achieve its precise opposite. Why is that? I suggest it is because our currently dominant model of reality is mistaken.

As a result, we badly need to rethink.

SCIENCE & TRUTH

It happened to him as it always happens to those who turn to science ... simply to get an answer to an everyday question of life. Science answered thousands of other very subtle and ingenious questions ... but not the one he was trying to solve.

—*Count Leo Tolstoy*¹

SCIENCE'S CLAIMS ON TRUTH

The antagonism between science and metaphysics has, like all family quarrels, been disastrous.

—*Alfred North Whitehead*¹

Science and metaphysics are inextricably united, and stand or fall together.

—*RG Collingwood*²

WHERE WOULD MOST OF US NOW, IN THE WEST, LOOK FOR TRUTH? SURELY the answer has to be science – science which has taken over from religion as the lodestar of our age. In an era of materialism, where the speed of societal change and the fusion of peoples have made traditional cultural values problematic, science alone holds out the promise of stable knowledge on which we can rely to build our picture of the world. And, within certain important limits, it is a promise that is certainly not in vain. People who ignore science are either afraid of it, because they don't understand it, or find its truths inconvenient. Science is a guiding light: if we put it out, we are in the dark. And precisely because it is so precious, we should be careful to guard it from ever-present dangers – exaggerated claims, models that distort, and institutional pressures, which effectively destroy its power and lead us into error.

In this chapter I want to look at the contribution science can make to our understanding of the world. Note, an *understanding of*, not just *knowledge about*: ‘knowledge, as an instrument of human progress’, writes physicist Claudio Ronchi, ‘can become, like the Gorgon, a goddess that transmutes anyone who gazes upon her into stone.’³ I will suggest that its contribution is of great value, but that there are intrinsic limits to what it can be expected to tell us, and that these limits all too often go unrecognised.

As someone whose practice and research depends on science, I have only respect for its proper aims and ambitions. Science is an essential part of our enquiring nature, and brings the potential for much that has transformed our lives for the better. No scientist is more frustrated than I am by those who dogmatically disregard its findings, especially where, in my field of medicine, those findings have power to save lives; and no-one could be more conscious of, or grateful for, the interminable scientific labours of others, from which I have hugely benefitted, in my work, in my practice, and in my life.

Yet science cannot possibly fulfil the burdensome role of sole purveyor of truth. This is not a failing in science. Good science is aware of its limitations. Scientism, the belief that science will one day answer all our questions, is not.

Some philosophically naïve individuals become very exercised if they sense that the status of science as sole purveyor of truth is challenged, as some of the less edifying exchanges on the internet testify. So let me make very clear at the outset that my purpose in what follows is to establish ourselves on a firmer footing in relation to science, by drawing attention to the quicksand in which we might otherwise go down. The greatest scientists, as we shall in due course see, have been well aware of these problems, even if they couldn’t have couched their warnings in terms of the hemisphere hypothesis. But very often the practice of science is not so self-aware; and then its propaganda about itself – the claims it wishes to make about both the truth of its discoveries and the exclusive validity of its approach to truth (‘thou shalt have no other gods before me’) – leads not so much to science, as to scientism.

It is obvious that science is heavily dependent on the exercise of what the left hemisphere offers. Science’s successes, in explaining how the world works and in helping us to control and manipulate that world to the extraordinary degree to which we now do, are unquestionable, and are

dependent on precisely those specific capacities which the left hemisphere contributes, capacities of analysis and for identifying mechanisms. There is no gainsaying that and I have no wish at all to gainsay it.

But we have seen in Part I what could be called the double problem of the left hemisphere: its inferiority, compared with the right hemisphere, in its receptiveness to and understanding of whatever it encounters; and, more dangerously, its tendency to mistake its re-presentations of reality (its simplified versions of what it encounters and its explanations of how those simplified versions work) for reality itself. It all too often then attempts to deny the right hemisphere any further role in the proceedings and seeks to persuade us that its necessarily partial re-presentations provide us with the wider understanding to which we aspire and to which we like to attach the word 'truth'. This is the hubris of the left hemisphere, beset with unknown unknowns, overconfident in its own prowess, while taking the upper hand. We have watched this in action in Part I.

In the next chapter I will explain why I am concerned by the harm done to science by the myopic effect of the models it sometimes espouses, by which we are needlessly depriving ourselves of scientific insights. And, finally, in the subsequent chapter, I will demonstrate why the scepticism that science officially espouses needs to be brought to bear on the 'science industry' itself, which is no more infallible instrument of true science than any church establishment is of true spiritual wisdom. But first, in this chapter, I want to look more fundamentally, in the context of the hemisphere hypothesis, at the boundaries of science's ambitions legitimately to tell us what is truthful.

UNDERSTANDING, EXPLANATION, METAPHOR AND MODELS

Let me begin with some very simple questions. The simplest questions are the trickiest. ‘How?’, ‘what?’, and ‘why?’ are particularly slippery. If I ask ‘how did she respond?’, you could answer ‘using her vocal apparatus’; or, understanding ‘how’ differently, you might say ‘with some scepticism, but not without her usual willingness to help’. Similarly if I ask ‘what causes an apple to drop from a tree?’ you readily reply ‘gravity’; but if I ask ‘what, actually, *is* gravity?’, you (ought to) pause, and will soon find yourself tied up in an infinite maze of self-referring propositions. Science can deal in each case with the first type of question, in which an explicit, mechanistic explanation is enquired about, and the accompanying framework that makes it comprehensible is taken for granted; but not in the second, in which that framework is transcended. And every toddler demonstrates that the question ‘why?’ can be carried on till all frameworks and mechanisms are transcended, and the reply has to be either ‘That’s just the way things are’, or ‘now you go to bed’.

Grasping what ‘with some scepticism, but not without her usual willingness to help’ means cannot be achieved through a framework of mechanical explanation; it requires something much more diffuse and implicit – understanding, the product of human experience. The first, explanation, is the left hemisphere’s mode; the second, understanding, the right hemisphere’s, albeit often enriched by the contribution of the left.

Explanation, science’s forte, is a subset – an explicit, rigorous, disciplined subset, but still a subset – of understanding. All understanding depends on metaphor. What we mean when we say we understand something is that we see it is like something else of which we are already prepared to say ‘I understand that’. That, in turn, we will have understood because we have likened it to something else we had previously understood, and so on. It’s metaphors all the way down.

In science this inescapable role of metaphor is manifest in the model the science uses in order to seek an explanation of the phenomenon it is investigating. Models are simply extended metaphors. The choice of model is crucial here because the problem for seekers after truth is that that choice

governs what we find. We find more or less according to what we put there. Since a model always highlights those aspects of what it is modelling that fit the model, any model soon begins to seem like an uncannily good fit, which means we espouse it with still greater confidence. And, as they say, to a man with a hammer, everything begins to look like a nail.

Even the sense-data that go into selecting the model are not innocent. Perceptions are laden with theory. We never just see something without seeing it *as* a something. We may think that our theories are shaped by observations, but it is as true that our observations are shaped by theories. This means we can be blind to some very obvious things in our immediate environment. We don't look where we don't expect to see, so that our expectations come to govern what we *can* see. This is why the model is crucial. In the past such a model was often something in the natural world – a tree, a river, a family. Nowadays, unless otherwise specified, it is the machine.

That a machine should be attractive as a model to science's helpmate, the left hemisphere, hardly needs – well, explaining. Machines are put together from parts and the left hemisphere's mode of operation is to break phenomena down into parts and then see how they can be put together again. Furthermore, putting parts together to make machines aids the left hemisphere's purpose: manipulation and control. So it is not surprising that for at least the last 250 years, the era in which science has enjoyed its most spectacular successes in explaining how the world works, and enabling us to use those explanations to manipulate and control it according to our purposes, the machine model should have been the default model in science. In the popular mind it remains science's defining paradigm.

Yet the machine model remains only a model, a form of metaphor. However productive it may have been in explaining and manipulating the world, it is still no more than a metaphor. As we shall see, even at the relatively lowly level of explanation it has exhausted its potential, something that was obvious in physics some time ago, and is becoming increasingly obvious in the life sciences. In other words, it doesn't fit with a multitude of important findings that can't be ignored.

The left hemisphere, however, is apt to forget, in the glow of its explanatory and manipulative successes, that in relation to truth, those successes are built on the absolutely necessary but inevitably shaky foundations of metaphor. Scientists often try to brush aside what they seem

to regard as this embarrassing fact. Models, which are extended metaphors, partial though they inevitably are, cannot be dispensed with, since understanding always involves seeing similarities to and difference from something else we think we understand. For example, Philip Ball (whose writings I generally admire), writing in *Nature*, opines that metaphors ‘at the very least, should be admitted into science only after strict examination.’⁴ Leaving aside the fact that the criteria by which any metaphor could be examined are themselves already derived from the application of a model, so that what one would be examining would be – not the intrinsic merit of the metaphor, but – whether it accorded with one’s already unexamined and taken-for-granted metaphor; and leaving aside the question how metaphors could be ‘admitted into’ science in a way that makes any such entry examination feasible; and leaving aside the issue of who we are going to entrust with the task of appraising them, since opinions about the applicability of individual metaphors will always differ, the whole idea is incoherent. Does he think that somehow we could get by for an instant without metaphors? Like many others he quotes the ‘warning’ attributed to cyberneticists Arturo Rosenblueth and Norbert Wiener: ‘The price of metaphor is eternal vigilance’, as if shaking his head over those who haven’t the strength of mind to divest themselves of the metaphor habit, and muttering ‘this will end in tears, you know’.

As a matter of fact, I cannot find that Rosenblueth & Wiener ever said this,⁵ but the sentiments are surely correct, even if not as Ball seems to have read them. That’s because the price of the pursuit of knowledge by any means whatever is eternal vigilance. However, the price of trying to think without metaphor would not only be eternal vigilance, but eternal vacuity. It’s as if someone were to say, the price of having tyres on your car is eternal vigilance. True, but there are risks in life that can’t be avoided if we are to get anywhere at all.⁶ The price of *doing science* is eternal vigilance, and not just because it can never avoid using metaphor.

What Rosenblueth & Wiener definitely do say is that since ‘the best material model for a cat is another, or preferably the same cat ... partial models, imperfect as they may be, are the only means developed by science for understanding the universe’. We can’t do without them, but we need to be sure the ones we have – this is the real point – are as little misleading as possible.⁷ And it’s the type of scientist who thinks he is not *inevitably* using metaphors and models that is most worrying, because unaware of the

pitfalls. We need to be vigilant in our use of metaphors, not because there is something dodgy about metaphor in general, but because there is something dodgy about many of the ones currently espoused by mainstream science. There I am in wholehearted agreement. We don't see what our metaphors blind us towards. This is the subject of Chapter 12.

All models are in this way a partial fit, giving a selective view of the matter. As the mathematician and philosopher Alfred North Whitehead puts it in *The Function of Reason*:

The man with a method good for purposes of his dominant interests, is a pathological case in respect to his wider judgment on the coordination of this method with a more complete experience. Priests and scientists, statesmen and men of business, philosophers and mathematicians, are all alike in this respect. We all start by being empiricists. But our empiricism is confined within our immediate interests. The more clearly we grasp the intellectual analysis of a way [of?] regulating procedure for the sake of those interests, the more decidedly we reject the inclusion of evidence which refuses to be immediately harmonized with the method before us. *Some of the major disasters of mankind have been produced by the narrowness of men with a good methodology.*⁸

Whitehead makes a distinction between what he calls 'the authority of science in the determination of its methodology' and its lack of authority in determining what counts as an explanation, let alone an understanding. And he points to the 'natural reaction of men with a useful methodology' against any evidence tending to limit the scope of that methodology:

Science has always suffered from the vice of overstatement. In this way conclusions true within strict limitations have been generalized dogmatically into a fallacious universality.⁹

Dogmatism inevitably obscures the nature of truth. He continues:

Obscurantism is the refusal to speculate freely on the limitations of traditional methods. It is more than that: it is the negation of the

importance of such speculation ... A few generations ago the clergy, or to speak more accurately, large sections of the clergy were the standing examples of obscurantism. Today their place has been taken by scientists ... The obscurantists of any generation are in the main constituted by the greater part of the practitioners of the dominant methodology. Today scientific methods are dominant, and scientists are the obscurantists.

The point is that we cannot discover whatever aspect of truth is revealed by a certain approach unless we commit ourselves to it sufficiently to find out; but by the very act of doing so, other aspects of truth become concealed, aspects which, when pointed out by others, will tend to be unrecognised, or ultimately dismissed.

‘In our time’, wrote the distinguished biochemist Erwin Chargaff, whose discoveries paved the way for Crick and Watson, and whose intellectual autobiography *Heraclitean Fire* should be read by every scientist,

so-called laws of nature are being fabricated on the assembly line. But how often is the regularity of these ‘laws of nature’ only the reflection of the regularity of the method employed in their formulation! ... Science is still faced with the age-old predicament, the lack of ultimate verification. ¹⁰

And he continues, in wise words,

In general, it is hoped that our road will lead to understanding; mostly it leads only to explanations. The difference between these two terms is also being forgotten ... These are two very different things, for we understand very little about nature. Even the most exact of our exact sciences float above axiomatic abysses that cannot be explored. It is true, when one’s reason runs a fever, one believes, as in a dream, that this understanding can be grasped; but when one wakes up and the fever is gone, all one is left with are litanies of shallowness. ¹¹

OBJECTIVITY

It would, of course, be absurd to dismiss the vast library of scientific knowledge as ‘litanies of shallowness’, and that is not what Chargaff intends. Rather, he is insisting on the vital difference between explanation and understanding. And, in speaking of ‘axiomatic abysses’ he is referring to aspects of scientific knowledge which we tend to take for granted but which need examining. None is in greater need of such examination than the notion of objectivity, a concept which we probably cannot do without, but which it is all too easy to misinterpret.

The popular, received view of objectivity goes something like this. We are here and the world is there. We are ‘subject’ and it is ‘object’. We want to have knowledge of how, in itself, the world really is. Science provides us with that objective knowledge by taking ‘us’ out of the picture, so removing subjective distortion from its objective presentation of how, in itself, the world actually is. This account of objectivity goes back at least as far as Descartes and underpins the popular view of why, since Descartes’ time, science has enjoyed such extraordinary prestige.

We have already seen, however, that this aspiration to take ‘us’ out of the picture is compromised by the fact that science can’t get going without metaphor and metaphor is something from which ‘we’ cannot possibly be divorced. But that is only a specific case of a more general point about how we cannot remove ourselves from the picture in the way this crude and misleading interpretation of objectivity requires. To put it bluntly, science, at least since the time of Descartes, has attempted to excise the most important part of any understanding, namely that, obviously enough, it is grounded in, takes place in, and is meaningless without, the human mind, and its capacity to understand.

To the extent that we have knowledge or experience of the world on which to base an understanding, we cannot know what it is like when we don’t know it. The existence of a distinct practice known as physics (which was not the case until the last few hundred years) alters what we see and take notice of, what we see but ignore, and what we may entirely fail to see; and it alters how we interpret our results, and their ultimate meaning, which is inevitably determined both by the individual doing the physics, and, since

no individual exists separate from a culture, by the often hidden assumptions of that culture. Human knowledge can only be more or less true – though, to be *absolutely* clear, this does nothing whatever to diminish the importance of truth. What we know cannot escape the fact that it is human knowledge; and we could fully know the qualities and limitations of *that* only by getting outside it, and having something else to compare it with – which is a logical impossibility.¹² As Max Planck, one of the founding fathers of quantum mechanics, pointed out, ‘science cannot solve the ultimate mystery of nature. And that is because, in the last analysis, we ourselves are part of nature and therefore part of the mystery that we are trying to solve.’¹³

Objectivity is always someone’s position, situated somewhere, and making some assumptions. There is no such thing as the ‘view from nowhere’. But there is such a thing as a view derived from considering as many positions as possible. We must not forget that scientists – like philosophers – are human beings, with personalities, temperaments, and experiences of life, all of which they do not hang up in the locker room when they put on their white coats. Although objectivity, in the sense of a fair consideration of all possibilities, is an honourable and necessary aim, objectivity in the sense of adopting a viewpoint that makes no presuppositions is intrinsically impossible to achieve. ‘We all, scientists and non-scientists, live on some inclined plane of credulity’, wrote William James. ‘The plane tips one way in one man, another way in another; and may he whose plane tips in no way be the first to cast a stone’.¹⁴

The Russian film-maker Andrei Tarkovsky pointed out that ‘objectivity can only be the author’s, and therefore subjective, even if he is editing a newsreel’. Any statement about anything is always both an inclusion and an exclusion, its meaning derived both from what is said and what is not: choices are always involved. This is not a point about documentary film-making, but about life. Ideas, including scientific ideas, do not live suspended in a vacuum, but have relationships across time, and at a point in time, with others, forming out of observed regularities the ‘models’, ‘laws’ and ‘principles’ which are our own creations, shaped as much by what they do *not* include as by what they do.

Adding to their contingency is a simple and very obvious point, the limitation imposed by our sense organs – and our brains. We can’t detect what our sense organs do not permit us to detect: there may be senses that

we could have had, but don't, which would have revealed other aspects of the world to our understanding and which we are incapable of imagining – could we have imagined what it is like to hear, if we had only sight, smell and touch to go on? When aboriginal people say that they can hear, or see, or sense things that we cannot, how do we know they are wrong? And the senses we do have are limited in extent: we can't hear what bats and bears take for granted in their world. It would be irrational to suppose we are directly aware of more than a little of what exists. Why assume that our cognition is capable of more than a few limited forays into the vastness of reality? Evolution is a process. We know more than mice (though there must also be things they know that we don't). A more highly evolved creature may one day regard our understanding of the world much as we now view that of the mouse.

'The wise scientist', wrote Chargaff, 'will be aware of the eternal predicament that between him and the world there always is the barrier of the human brain.'¹⁵ That is one way of looking at it. Another would be that, like every shared boundary, it can act to separate or unite, act as a barrier *or* as point of contact: the ear drum is a boundary, but one essential to hearing. It's just that we need to be aware, as Chargaff suggests, that we can only know the world as our brains construe it; and in every brain there are at least two internally coherent versions of the world that conflict. Science must take this into account when it talks of objectivity.

Observations are not as simple as they are conceived to be, even if there is apparently complete agreement between a number of them. 'Whether you can observe a thing or not depends on the theory which you use', as Einstein pointed out.¹⁶ According to philosopher of science Norwood Hanson, referring to a famous optical illusion in which figure and ground are reversible, two 'drawings might be indistinguishable. I see a goblet, however, and you see two men staring at one another. Do we see the same thing? Of course we do. But then again we do not.' Note, by the way, that though the image can be seen as two quite different things, it can't be seen as just any old thing. It can't be seen as a rabbit, not even a duck-rabbit. Our alternatives are not single truth or chaos. And Hanson continues that to conclude that scientists

make the same observations but use them differently is too easy ...
Were there no sense in which they were different observations they

could not be used differently ... There is a sense, then, in which seeing is a ‘theory-laden’ undertaking.¹⁷

He uses the example of Tycho Brahe and Johannes Kepler registering the same sense-data on seeing the sun rise, but seeing something quite different – since Brahe, unlike Kepler, believed the position of the earth was fixed. Advocates of different scientific theories clash because they see the same sense-data differently and use the same words to refer to what are in fact distinct conceptions: competing theories lead to differing observations as much as differing observations lead to competing theories.

If this is fatal to objectivity as it is commonly, and naïvely, understood, it is absolutely not fatal to the best motives that lie behind the wish to claim objective status. As scientists or citizens, we rightly fear the loss of a hierarchy of value, the loss of grounds for believing that some judgments are to be preferred to others, that some statements are inevitably truer than others. Indeed, the flawed fact-value distinction is itself an *appeal* to value – the value of ‘facts’ – and is in turn *based* on value – inevitably and rightly – not on fact. And it stems from an honourable, noble urge: an allegiance to truth. It’s just that it ends up in the mistaken assumption of a subject-object divide.

According to Polányi scholar CP Goodman,

[Michael Polányi] notes that all methods, even the most formalised, rely upon our judgements. It is not possible to absent ourselves, and nor should we try. If all knowing involves the participation of a knower, then it follows that all knowing is a form of valuation. We make judgements about what we ought to believe. Our beliefs may be mistaken, but they are not arbitrary. They are guided by our tacit awareness. In his analysis of the structure of tacit knowing – his key contribution to philosophy – Polányi seeks to reconcile fact and value (which in the modern period have been broken apart).¹⁸

Just because we can’t measure values, they are neither less important, nor less rightly operative, in science: the confusion comes from science’s reluctance to accept as real what cannot be pinned down and measured. It therefore unwittingly drives itself into a cul-de-sac: the false divorce of fact

from value. Note that the *distinction* is valid: it is the *divorce* that, as so often, causes the problem. Science frequently passes over entities, however important they may be, that cannot be measured. Attempts to evaluate systems often end up measuring what can easily be measured, rather than what actually matters, but can't be measured.

Science places a very high value, too, on precision and consistency. But what about those things that are either intrinsically imprecise, can't be generalised, change their nature when made explicit, alter with the very fact of observation, or tend to fluctuate widely in their manifestations? They are still real, and some of them are very important. I don't say there are no scientific ways of dealing with them, just that in practice it is much harder – and it often doesn't happen. As biochemist Addy Pross remarks:

Some characteristics of undeniable scientific interest are inherently difficult to quantify, or are even unquantifiable. Attempts to quantify the unquantifiable will be unrewarding and may only lead to confusion.¹⁹

And what about those cases where apparent opposites come together, where light is both wave and particle, or where, as in the human sciences, to be wholly rationalistic may well be irrational?

What we should conclude is not that the unimpeachable drive behind the crudely interpreted concept of objectivity is mistaken, but that we should be more nuanced in our interpretation. It is an enterprise, a continuing process, not a 'thing' that could ever be finally achieved. It involves a habit of mind and spirit, not the following of external procedures or rules. Put another way, the 'objectivity' lies not in propositions, but in a disciplined disposition; in a modest recognition that our existing answers are inadequate, and in a constant awareness of limitations in handling the possible alternative, always provisional, answers. The foundations of physical reality can never be known with any certainty: as Gleiser puts it, 'in the quantum realm the very question of trying to know more, of trying to go beyond the limits imposed by uncertainty, doesn't make sense ... Final theories are incompatible with the scientific method. Given that we can only accrue scientific knowledge from measurements of natural processes,

it is by definition impossible to be certain that we know all the forces of Nature or the fundamental particles that exist.’²⁰

This has nothing to do with the deeply pernicious – not to say incoherent – view that anything goes. Pernicious, because it effortlessly exalts any cracked ideology to the same level as the distilled wisdom of a civilisation, and thereby debases the distilled wisdom of a civilisation to the level of any cracked ideology. Incoherent, because, if anything goes, nothing goes: we no longer have any purchase on reality. My position is that almost nothing goes: the whole purpose of education, self-discipline and scholarship being the honest, open and humble attempt to find whatever lies in that space closest to the truth, in the knowledge that success is always a matter of degree. But that degree is of the utmost significance.

From experience we know that our own views can be more or less faithful accounts of what, from everything we know, we can reasonably claim to be the case. The ‘more or less’ depends on a range of circumstances, all tending to converge on the degree to which we are inclined to consider *different* points of view. Generally we get better at this with maturity, though both temperament and intelligence are bound to play a part in inter-individual differences. This process could be thought of as the habit of tempering truths with their true opposites. Truth is a matter not merely of quantity, but of quality; not just of degree, but of the manner of its holding.

As John Stuart Mill so wisely said (speaking about social science, but it applies more widely):

All students of man and society who possess that first requisite for so difficult a study, a due sense of its difficulties, are aware that the *besetting danger is not so much of embracing falsehood for truth, as of mistaking part of the truth for the whole*. It might be plausibly maintained that in almost every one of the leading controversies, past or present, in social philosophy, both sides were in the right in what they affirmed, though wrong in what they denied; and that if either could have been made to take the other’s views in addition to its own, little more would have been needed to make its doctrine correct.²¹

Mill's point about 'mistaking part of the truth for the whole' is echoed by Whitehead: 'There are no whole truths; all truths are half-truths. It is trying to treat them as whole truths that plays the devil.'²² And, with particular relevance to science:

In scientific investigations the question, True or False?, is usually irrelevant. The important question is, In what circumstances is this formula true, and in what circumstances is it false?²³

The neglect of context or circumstance sacrifices subtlety to 'all or nothing' answers. Science tends to take things out of context – in fact, many would say that this is exactly what is special about a genuinely scientific explanation. I have written about the problem of decontextualisation elsewhere, and the significance of this fallacy in every aspect of life.²⁴ John Dewey thought it the most serious mistake philosophy can make, and it inevitably results in a distorted account of whatever it aims to illuminate.²⁵

Science is the stronger for being freed from the superstitious beliefs that are foisted on her by her false friends, those who are in love with certainty and need to know they are right (there are many of these in religion, and in politics, too, so science is not alone). There is among many of the public, as Nassim Nicholas Taleb points out, 'a religious belief in the unconditional power of organised science, one that has replaced unconditional religious belief in organised religion ... We have managed to transfer religious belief into gullibility for whatever can masquerade as science.'²⁶ No good is done to science by making the inflated claims that, unfortunately, some naïve scientists do make on her behalf – thinking that they thereby do her a favour. Obvious discrepancies between the excessive claims of any culture and human experience lead eventually to a countermovement that ends in disaster: the baby gets thrown out with the bathwater.

The danger of the claim that science provides full and 'objective' truth, in the crude sense of that word, is that as soon as it becomes apparent, as it readily does, that this way of understanding objectivity is not watertight, the whole ship is in danger of sinking: its apparent robustness – a hard and fast, all or nothing, supposedly cast-iron concept – renders it fragile. A Titanic claim invites disaster when the ship collides with the inevitable iceberg of philosophical reflection. For then, the only options become total

impregnability or a shipwreck: science is either high and mighty or 'just a matter of opinion', like any other. Neither of these positions is supportable: each is dangerous. And so it is that another untruth triumphs in their place: the malign idea that science cannot be distinguished from claptrap.

HIDDEN ASSUMPTIONS

‘Science doesn’t think’, as Heidegger put it. ‘*Science* doesn’t venture into the *realm of philosophy*. It is a realm, however, on which, without her knowing it, she is *dependent*.’ ²⁷

Earlier I quoted Erwin Chargaff’s remark that even the most exact sciences float above ‘axiomatic abysses’: unexamined assumptions. It is a tenet of science that its basic intellectual aim is to improve knowledge about the world, nothing being permanently presupposed about the world independently of evidence. But ‘to say, with the radical empiricist, that only factual statements have validity is to be not only dogmatic but self-contradictory, since the statement itself is not factual.’ ²⁸ Its ‘truth’ is an assumption based on intuition, not on any kind of fact, logic or science in itself. That is fine, but it needs to be acknowledged. So does the assumption that contraries are incompatible. After all, one of the greatest scientists of all time, Niels Bohr, adopted the opposite assertion – *contraria sunt complementa* – as his motto.

The philosopher of science Nicholas Maxwell has demonstrated at some length that the claim that science presupposes nothing about the world independently of evidence is untenable. ²⁹ For a start, it is not only presupposed by science that the universe is fully comprehensible (which means, inevitably, comprehensible by a human being), but presupposed that it is fully comprehensible *physically*. Thus matter, according to convention, can be assumed, but consciousness cannot – indeed, as is well known, there are philosophers who deny the very existence of consciousness.

‘To many working scientists’, writes philosopher Bryan Magee,

science seems very obviously to suggest an ultimate explanation, namely a materialist one; but a materialist view of total reality is a metaphysics, not a scientific theory. There is no possibility whatever of scientifically proving, or disproving, it. The fact that it is held by many scientists no more makes it a scientific theory than it can be said to be an economic theory because it is held (no doubt) by many economists. ³⁰

An element of faith is necessarily involved in the scientific process. That is in no way to the discredit of science, since all paths to knowledge whatever have to involve assumptions built into the model, as well as certain axioms, 'truths' that cannot be proven, but are taken for granted. Science requires a degree of commitment to an idea for a while until one finds out whether or not it works: without engagement many truths will escape us, which is why, inside or outside science, it is not an option to sit on the side-lines of life, waiting for 'objective' evidence to accumulate before making a commitment. Speaking of the elementary laws from which the rest of physics must be deduced, Einstein had this to say: 'To these elementary laws there leads no logical path, but only intuition, supported by being sympathetically in touch with experience.'³¹ This is Pragmatism, pure and simple: and, as the reader will know, I agree that we cannot do better than Pragmatism in any approach to truth.

Furthermore, science depends on the idea of cause and effect mechanisms, a phenomenon that parallels the logic whereby the left hemisphere puts back together the bits and pieces. But the concept of a cause is not transparently obvious. As used by scientists, the term 'causation' admits of at least seven, possibly more, meanings.³² According to the anthropologist Pascal Boyer, in scientific thinking 'the only stable "principles" are vague, unconstraining generalisations that', he argues, 'do not rule out magical connections'.³³ I would not go so far myself, but the point that when we construct formal relations of a causative nature these may issue in different kinds of understanding that are not necessarily explicit is well taken.

It is also assumed that the same principles that govern the part of the cosmos that we observe obtain everywhere and for all time; to abandon that tenet would be to threaten the terms on which an understanding of the universe as a whole could be achieved. But in fact, as Max Planck observed, 'we have no right to assume that any physical laws exist, or if they have existed up to now, that they will continue to exist in a similar manner in the future.'³⁴ All we know is that there are local habits in the part of the universe we inhabit.³⁵ Newton may have said *hypotheses non fingo* ('I don't make up hypotheses'), but at the same time his so-called 'Universal Law' of gravity was just that: a brilliant hypothesis.³⁶ That it was a law, let alone a universal one, he did not know then, nor do we know now.

As Pross writes in his interesting book *What is Life?*

In contrast to terms such as ‘theories’ and ‘laws’ which radiate some sense of absolute truth, the term ‘pattern’ is more subtle, less committed, less definitive, more open to modification. Even Newton’s laws, those pertaining to gravity and motion, have had to undergo revision following Einstein’s revolutionary insights. If we keep in mind that every hypothesis, theory, or law is ultimately just a pattern, the day that theory or law is modified or revoked will be less surprising, less disconcerting.³⁷

A further questionable assumption is that there is nothing purposive about the cosmos: something which we cannot know, requires the making of further assumptions, and in the end fits the findings no better than – arguably not as well as – the assumption of purpose (a complex issue to which I will return in Chapter 27). This does not exhaust the assumptions science makes.

My point here is simply to show that there are many assumptions built into science, for good or ill. These may be reasonable assumptions, but they are undoubtedly metaphysical assumptions, not deductions from evidence. The first of these assumptions, that the world is humanly comprehensible, is necessary for the great project of science to get off the ground, so it is an entirely reasonable assumption. But it is still an assumption, for all that, one that is usually forgotten, and it has consequences. If you assume that the world must be comprehensible in purely physical terms, that there are no purposes in Nature or the cosmos, and that contraries exclude one another, what you end up seeing and calling ‘truth’ will be different from what you see if you make no such assumptions.

Since one cannot become aware of what it is one is not aware of, the fact that a system or model works for certain purposes indicates only *that* – that it works – and no more. As the physicist and mathematician John von Neumann put it:

The sciences do not try to explain, they hardly even try to interpret, they mainly make models ... The justification of such a

mathematical construct is solely and precisely that it is expected to work.³⁸

It shows us what that model can show, but cannot help us see what it obscures. Science's explanations both reveal and conceal. Reducing assumptions to a minimum, as science certainly aspires to do, is a good principle; but we shouldn't run away with the idea that that minimum is very small, let alone that science has managed to dispense with assumptions altogether. And if reducing assumptions to a minimum is the goal, why is the greater assumption, that the world is physically understandable, preferable to the lesser assumption, that it is simply understandable? The assumed primacy of matter is something to which I shall return in Chapters 24 and 25.

THE MYTH OF THE SCIENTIFIC METHOD

One of the consequences of the post-Cartesian notion of scientific objectivity, of a world ‘out there’ that we ‘in here’ can gain objective knowledge of, is that ‘we’ must keep out of the method of enquiry. This has generated the reductive myth of the scientific method, an account of science operating in a deeply impersonal manner such that the scientist’s imagination almost entirely disappears from view. According to the myth, scientific knowledge arises from the rigorous, logically sequential unfolding of whatever follows securely from predictable procedures by calculation according to fixed laws. But this myth utterly fails to do justice to what the work of science actually involves. The sheer, staggering work of imagination and inspiration that is science, its discoveries unpredictable and recalcitrant to compulsion by laws or procedures – real, living science – is swept away in this myth, this representation of science as something pedestrian, uninspired, essentially bureaucratic – and dead. It renders science something that a computer could do better than human beings. The distinction between these two accounts of science is the one Chargaff makes between rare, genuine scientists and drudges in the vast institutional machinery of science. Readers will spot, in the myth’s deathly representation of scientific life as merely following procedures, the signature of the left hemisphere, and its grandiose aspirations to certainty. ‘Science is no longer identified with certitude and probability with ignorance,’³⁹ wrote Ilya Prigogine. In fact, science is a matter of probability and certitude a matter of ignorance.

Oddly, despite so much evidence to the contrary, it still needs emphasising that in practice science progresses by many more fruitful routes than the fabled ‘scientific method’. After describing the textbook version, George Gaylord Simpson, one of the most influential contributors to the reigning ‘Modern Synthesis’ in genetics, observes:

It quite ignores the most difficult, most creative, and most important elements of scientific endeavour. How does one discern a problem, or decide what kinds of questions are to be asked? How does one determine what observations are relevant? And especially, what kind

of hypothetical solutions are acceptable and where do they come from? Perhaps the most cogent objection of all is that important basic research has seldom really followed the ‘method’ just as it is stated.⁴⁰

In other words, you can’t even start on the scientific method without making assumptions, using judgment and having insights, insights that are not part of the method, and do not follow any kind of formal principles – and the method is in any case unlikely to produce ‘important’ results.

The process of science has much less to do with logic than has classically been assumed.⁴¹ ‘Science-in-practice is often driven by hunches and vague impressions’, according to Yale psychologists, Leonid Rozenblit and Frank Keil, who have studied how much we know and how we come by such knowledge in various settings.⁴² For a start, science depends on good hypotheses. Not only is there nothing wrong with that, but it is essential to the nature of science that it imaginatively selects its assumptions, which it discards only when they don’t work. Newton need not have been so defensive about dealing in hypotheses.

Science could never get off the ground if untold numbers of fruitless hypotheses had to be taken equally seriously and subjected to the same procedure so that they could be systematically eliminated. It therefore requires the exercise of imagination from the outset, which alone can supply interesting and potentially fruitful hypotheses, and eliminate intuitively unfruitful ones. While respecting the data out of which they emerge, good hypotheses always ‘go beyond’ the immediate facts.

As the biologist Peter Medawar wrote,

Scientists should not be ashamed to admit, as many of them apparently are ashamed to admit, that hypotheses appear in their minds along uncharted by-ways of thought; that they are imaginative and inspirational in character; that they are indeed adventures of the mind.⁴³

Anna Sfard, a professor of mathematics, has studied the ways in which scientists and mathematicians reach their conclusions. From interviewing them at length, she concluded that

it was quite clear that, for them, one of the best indications of understanding is the ability to sense that something is true in an immediate manner, without having recourse to a formal proof ... 'Having a result' without knowing how it was obtained is perhaps the most striking phenomenon in the work of a mathematician.⁴⁴

This could be seen as a direct account from experience of how the right hemisphere first intuits something as a *Gestalt* before the left hemisphere sets about systematising it. 'I hope no one still thinks that theories are deduced by strict logical conclusions from lab records', wrote Wolfgang Pauli, a pioneer of quantum physics, in 1957, 'a view which was still all the rage in my student days. Theories arise from *seeing* something inspired by empirical data'.⁴⁵ Scientists who think science consists of unprejudiced data-gathering without speculation aspire, in Medawar's phrase, merely to 'browse over the field of nature like cows at pasture'.⁴⁶

That results precede arguments 'was a commonplace for ancient mathematicians ... The Greeks did not think much of propositions they happened to hit upon in the deductive direction without having previously guessed them'.⁴⁷ Carl Friedrich Gauss, one of the most fertile mathematical minds of all time, remarked 'I have had my results for a long time; but I do not know yet how I am to arrive at them'. To pick two famous mathematicians out of many, Johann Euler, who was also an astronomer, stated that arithmetical theorems are 'discovered long before their truth has been confirmed by rigid demonstration'; and George Pólya that 'you have to guess a mathematical theorem before you prove it'. The philosopher of science and mathematics Imre Lakatos emphasised that science is effectively a *dynamic* process in which results are never final, unchanging 'nuggets' of truth.⁴⁸

Karin Knorr interviewed scientists about their work and found that when they described the origin of an innovative piece of research, they talked about having grasped a 'similarity between hitherto unrelated problems and contexts'.⁴⁹ In other words, they proceeded by analogy rather than analysis. It is no surprise, therefore, that it is often through images – metaphors – rather than supposed chains of logic, that scientists and mathematicians make their greatest discoveries. 'The words or the language, as they are written or spoken', wrote Einstein, 'do not seem to

play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be “voluntarily” reproduced and combined ... The above mentioned elements are, in my case, of visual and some of muscular type.’⁵⁰ It is said that Kekulé seized the shape of the benzene ring, the foundation of organic chemistry, when the image of a snake biting its tail arose from the embers of his fire;⁵¹ Mendeleev saw the structure of the periodic table of the elements in a dream.⁵² The seminal mathematician Solomon Lefschetz

saw mathematics not as logic but as pictures. His insights were great, but his ‘proofs’ were almost always wrong.⁵³

Michael Faraday is one of the most influential scientists in history, who made hugely important advances in our understanding of magnetism and electricity. According to Helmholtz,

with quite a wonderful sagacity and intellectual precision, Faraday performed in his brain the work of a great mathematician without using a single mathematical formula ... it is in the highest degree astonishing to see what a large number of general theorems, the methodical deduction of which requires the highest powers of mathematical analysis, he found by a kind of intuition, with the security of instinct, without the help of a single mathematical formula.⁵⁴

Some people might be surprised to learn that Niels Bohr’s research notebooks contained only pictures and words, no mathematical formulae.⁵⁵ Heisenberg writes of Bohr, arguably the greatest physicist of the last century: ‘We could clearly sense that he had reached his results not so much by calculation and demonstration as by intuition and inspiration, and that he found it difficult to justify his findings before Göttingen’s famous school of mathematics’.⁵⁶

It is not, moreover, just that a few gifted geniuses who rock the foundations need imagination to make their discoveries. The whole enterprise of science as she is practised is dependent on imagination in

order to interpret what it is one is seeing. The problem is not that it is hard to rule out the human element, but that by attempting to rule it out – especially by ignoring the role of interpretation – we misrepresent the situation we describe. A particularly striking example is given by the economist Robert Chambers: 22 different studies of soil erosion in one catchment area in Sri Lanka yielded figures that differed by a factor of 8,000. ‘The scary part’, comments David Boyle, ‘is that all the figures were probably correct, but the one thing they failed to provide was objective information. For that you need interpretation, quality, imagination.’⁵⁷ Better still would be to accept that objective is a relative term, and that truth is, too: complex, multifaceted, rarely if ever single, never simple. Which, to repeat, since the point is so vital, does not for an instant imply giving up on it altogether.

In all science, moreover, chance plays as prominent a role as any method. Alexander Fleming’s chance discovery of the antibiotic applications of penicillin is too well known to need relating, but to take a few examples out of many from my own field, almost every treatment for bipolar disorder was discovered ‘by mistake’, not by scientific method. Lithium’s effect as a mood stabiliser was discovered indirectly: urea was initially thought to be a mood stabiliser (it is not), and it just happened that the lithium salt of urea was used. Later it was found that it was not the urea, but the lithium, that worked.⁵⁸ Another mood stabiliser, carbamazepine, was discovered during a search for antihistamines. Valproate was developed in Germany during the war as a butter substitute – it was used in pills as a diluent: it turned out that the diluent was what did the trick. Serendipity is the scientist’s friend; but it is a reciprocal relationship, as friendships are. As Pasteur put it, ‘in the field of observation chance favours only the prepared mind’.⁵⁹

Once again, this does not discredit science in any way: it shows, instead, what an exciting and humbling business science is. We *collaborate* with nature, and with fortune, pay attention and learn from her. We neither withdraw the human element, as the myth of the scientific method implies, nor *force* nature to our preconceived ends. With our limited understanding, and limited capacity to understand, that would be foolishness indeed. As Bacon, who is reputed to be the one who wanted to put Nature on the rack, nevertheless put it, ‘Nature to be commanded must be obeyed ... The

subtlety of Nature is greater many times over than the subtlety of the senses and understanding.’⁶⁰

So, far from being the impersonal, robotic business that the myth of the scientific method would imply, the actual practice of science in pursuit of truth is profoundly human. And at its core lies a human attribute to which no robot or computer could make any claim. As Max Planck put it:

Anybody who has been seriously engaged in scientific work of any kind realizes that over the entrance to the gates of the temple of science are written the words: *Ye must have faith*. It is a quality which the scientists cannot dispense with.⁶¹

SCIENCE'S AWARENESS OF ITS OWN LIMITS

In drawing attention to a widely held, but false, view of objectivity, to hidden assumptions that are blithely made, and to a misleading account of how science is practised, I am not, of course, suggesting that every scientist is in thrall to these misconceptions. Far from it. Many scientists are well aware of the inescapable limitations attending upon what they do and, consequently, of how qualified must be science's claims to truth and how false is any meta-claim that science has exclusive access to truth. Humility is not unknown in the scientific world.

Science has shown itself perfectly capable – at certain tipping points in its history – of recognising that it may be barking up the wrong tree or, at least, that the particular sort of barking it has been engaged in has run its course and that quite different trees merit attention. For example, it was physicists who definitively jettisoned the machine model around the time of the First World War, when their findings could no longer be made to fit the assumptions the model makes. The fundamental structure of the cosmos, they discovered, simply had few of the qualities of a machine. Revising the model has revealed further conundrums that require to be solved. Physics being the most philosophically sophisticated branch of science, it is only to be expected that it will recognise how very far it is from having all the answers, since the hallmark of a greater understanding is awareness of one's own limits. Promises from physics' more zealous exponents that a 'Theory of Everything' is just around the corner should be treated with caution: it has been just around the corner for over a century.

One of the most sharp-eyed observers of the current situation in physics is cosmologist and theoretical physicist Lee Smolin. 'Those scientists who work on the foundations of any given field', he points out, 'are fully aware that the building blocks are never as solid as their colleagues' – and, *a fortiori*, the general public – 'tend to believe.'⁶²

For example, to return to the question of how rooted in evidence science needs to be, but how hard a criterion that is, in practice, to fulfil, he comments on the idea of extra dimensions: 'in fact, neither theory nor experiment offers any evidence at all that extra dimensions exist.'⁶³ Neither is there any evidence whatever that there is an infinity of universes –

another popular theoretical gambit, driven by the desire to avoid the clearly unpalatable conclusion that intelligence might be intrinsic to the one universe of which we know something. It is another version of ‘anything goes’ (in an infinite number of universes, everything is as true as anything else), this time coming, alarmingly, from scientists who should know better.

My point is not here to argue that there are, or are not, a multitude of universes, something I am unqualified to do, but to suggest that the public idea of science as securely rooted in fact is a half-truth.

Of string theory, Smolin comments, ‘despite the absence of experimental support and precise formulation, the theory is believed by some of its adherents with a certainty that seems emotional rather than rational.’⁶⁴ Pouring cold water on the fervour, he quotes the physicist Brian Greene:

Even today, more than three decades after its initial articulation, most string practitioners believe we still don’t have a comprehensive answer to the rudimentary question, What is string theory?⁶⁵

This comes, not from someone out of touch with scientific thinking on the issue, but from the Professor of Physics and Co-Director of Columbia University’s Institute for ... Strings, Cosmology, and Astroparticle Physics.

I suspect Smolin may not be entirely impartial here; and certainly I can have no personal view on string theory, which, within the considerable limits of my understanding of it, is in some ways highly congenial to my philosophy that processes are more fundamental than particles. I have nothing to say against it. Behaving as if string theory were true helps to explain things otherwise not apparently explicable. But that is what we are doing: making an assumption, one that to many people is elegant and helpful, but is unproven and may be intrinsically incapable of proof other than the excellent Pragmatist one that it works better than alternatives. No-one has been, and maybe no-one ever will be, able to detect a string (or the existence of the six extra dimensions the equations of string theory require). My point is not about string theory: it is that science is, and must be, alive, provisional and uncertain, not, as many non-scientists are led to assume, laid out cold on a slab.

Smolin continues:

We must be careful to present the failures along with the successes. Indeed, being honest about failures is likely to help rather than hurt our cause ... In recent years, many books and magazine articles for the general public have described the amazing new ideas that theoretical physicists have been working on. Some of these chronicles have been less than careful about explaining just how far the new ideas are from both experimental test and mathematical proof.⁶⁶

In quantum mechanics the picture is considerably better, but even there clarity and certainty cannot be claimed, according to Anton Zeilinger and colleagues:

Quantum theory is based on a clear mathematical apparatus, has enormous significance for the natural sciences, enjoys phenomenal predictive success, and plays a critical role in modern technological developments. Yet, nearly 90 years after the theory's development, there is still no consensus in the scientific community regarding the interpretation of the theory's foundational building blocks.⁶⁷

Great scientists tend to be very cautious about the claims that can be made for science. J.B.S. Haldane's famous remark that the universe is probably not just queerer than we suppose, but queerer than we *can* suppose, puts its finger firmly on the point at issue. Humility of approach displays insight. 'How shallow, puny, and imperfect are efforts to sound the depths in the nature of things', wrote Whitehead. 'In philosophical discussion, the merest hint of dogmatic certainty as to finality of statement is an exhibition of folly.'⁶⁸

And, finally, there is an obvious point that still needs to be made despite its being so obvious. There are realms of human experience, vast realms of the reality that constitute 'the world' as human beings encounter it, that are beyond the methods of science to investigate in anything other than a trivial way. Erwin Schrödinger put his finger on it when he graphically described the process involved in trying to comprehend (rather than explain) the world in a scientific way, and what then ensued:

I actually do cut out my mind when I construct the real world around me. And I am not aware of this cutting out. And then I am very astonished that the scientific picture of the real world around me is very deficient. It gives a lot of factual information, puts all our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us ... Science sometimes pretends to answer questions in these domains, but the answers are very often so silly that we are not inclined to take them seriously.⁶⁹

Some scientists have become rather famous through promoting their 'discovery' of the purposelessness of life. But science could never discover any such thing. According to its own assumption, its method excludes questions of teleology altogether. Science understandably does not find a purpose, because purpose is not something its way of thinking recognises. That is not a criticism of science *per se*. At most it is a criticism of a certain 'philosophy' of science, rarely critically examined, or even challenged; more generally it is a criticism of those who want to take the methodology of science into realms where it has no purchase on reality. When it comes to the really big questions – such as the nature, meaning or purpose of life, consciousness, time, love, energy, matter, beauty, truth or goodness – science encounters the limitations inherent in its dependence on models as the necessary means of proceeding, for in these cases there not only isn't an appropriate model, there can't be one, because each of them is completely *sui generis*. The ultimate nature of reality, as well as the origin of values, meaning and purpose in life, lie beyond the remit of science, though they continue to be of supreme importance for living. To quote Bertrand Russell: 'Almost all the questions of most interest to speculative minds are such as science cannot answer ... Science tells us what we can know, but what we can know is little, and if we forget how much we cannot know we become insensitive to many things of great importance.'⁷⁰

CONCLUSION

In conclusion, the point I wish to make – and I cannot emphasise it strongly enough – is that just because what we rightly take to be scientific truths are not ‘objective’ in the sense that nothing human, contingent and fallible enters into them, this does *not* mean they have no legitimate claim to be called true. Such a position would be trivial and absurd. My point is that truth is *never* objective in this, artificially limited, sense. But, important as it is to recognise that, it is every bit as important to validate science’s attempt to respond as fairly and fully to the reality with which it engages. Fairly, like fully, means inhabiting a number of points of view, not fruitlessly attempting to inhabit none. All knowledge whatsoever is contextual and contingent. The observer inevitably alters what is observed. Yes, OK. But that tells us about the nature of truth, not about the undiminished value of science.

I also want to emphasise that the scientific process cannot be free from assumptions, or values; that its advance requires imagination, as well as serendipity – not merely the stolid adherence to a procedure; and that it represents a rich creative process, always provisional, requiring breadth and depth of thinking, and that that is why we rightly value it so highly. Here again one sees the contrast between how the left hemisphere would conceive science and how the right hemisphere would do so, a subject I will explore further in the next two chapters. In science we need a balance between what *each* hemisphere provides, not just the contribution of one, be it left or right. However, there is no question that there is currently an imbalance. As Roger Sperry’s colleague Jerre Levy put it: ‘One gets the suspicion that 18 or so years of formal schooling in the sciences may functionally ablate the right hemisphere.’⁷¹

Bear in mind, moreover, that the left hemisphere is the manipulator: it presumes that the purpose of science is to help us exploit the world. In the Introduction, I quoted Erwin Schrödinger’s important words, from *Science and Humanism*, that the value of science lies in forming part of the knowledge humanity can bring to bear on the ultimate question, the question of Plotinus’: ‘who are we?’ That, of course, requires a much broader scope, more typical of the right hemisphere’s understanding.

Wendell Berry points out that ‘the modern university is organised to divide the disciplines; that universities pay little or no attention to the local and earthly effects of the work that is done in them; and that in the universities one discipline is rarely called upon to answer the questions that might be asked of it by another discipline.’⁷² These are serious problems, and I hope the path taken by this book will play a part in redressing them, even if only a little. But to address Plotinus’ question from within the discipline of science rather than the humanities, we would need especially to turn to the science of life. That forms the subject of the next chapter.

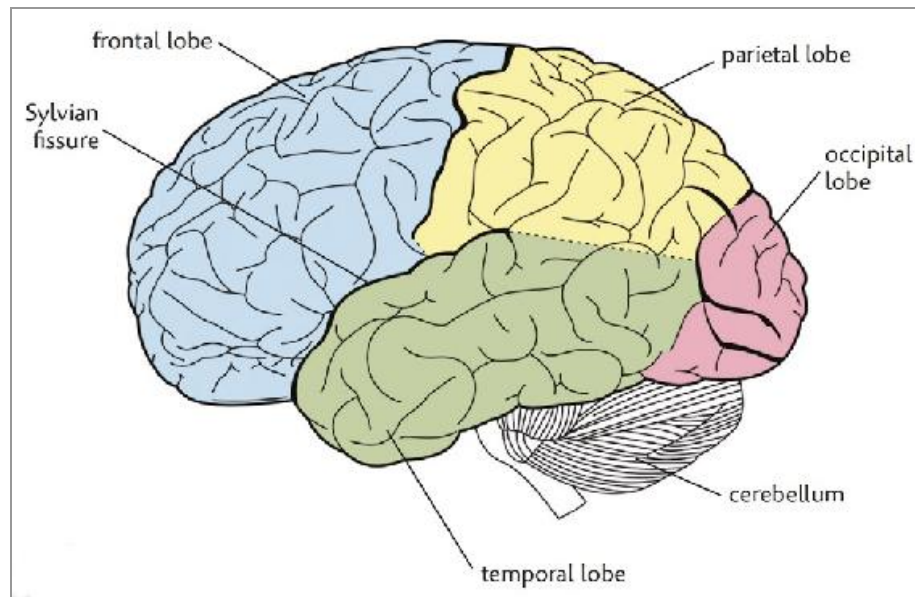


Plate 1[a] Lobes of the brain

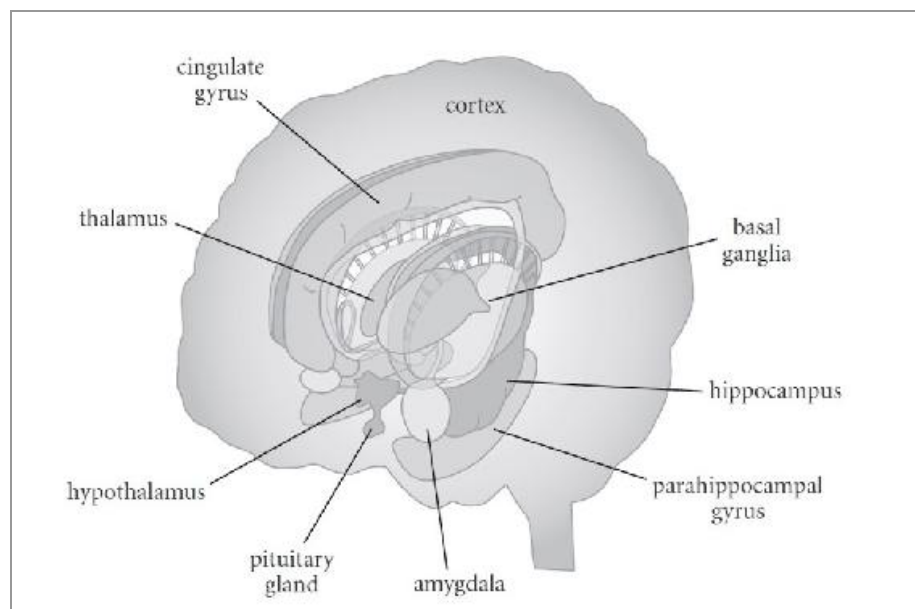


Plate 1[b] · Diencephalon, basal ganglia and limbic system

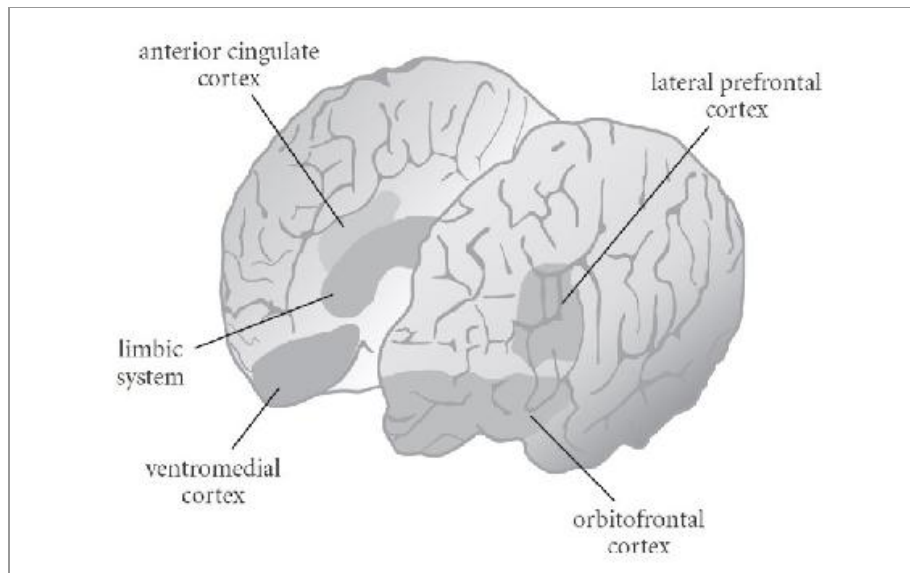


Plate 1[c] · Prefrontal cortex and limbic system

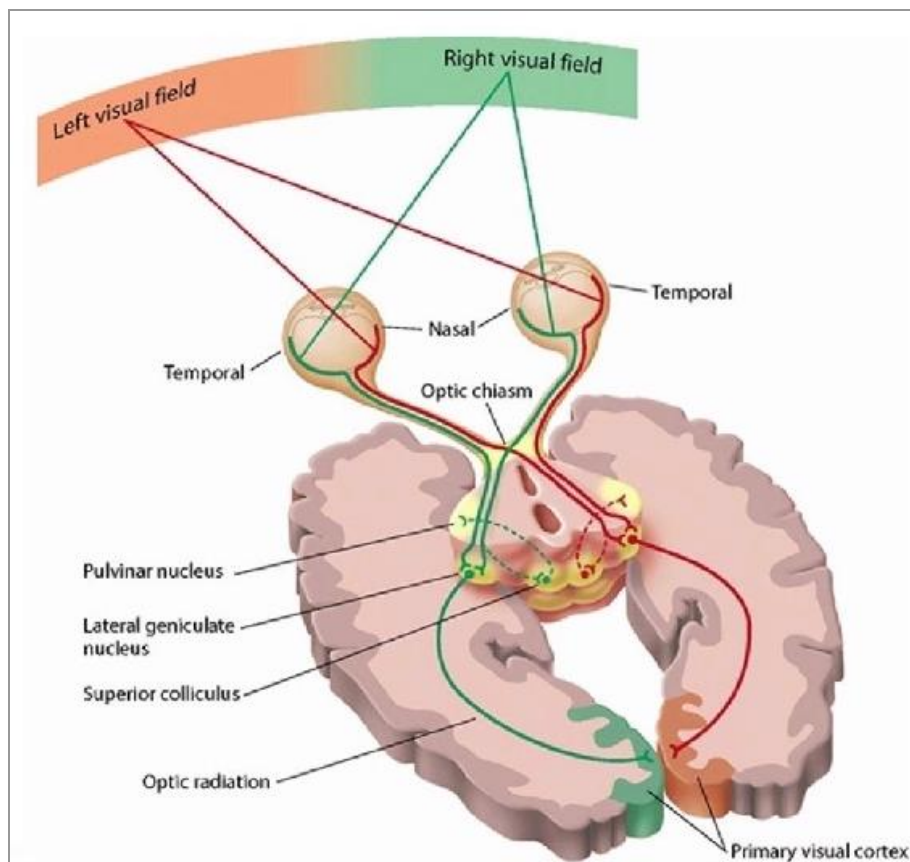


Plate 1[d] · Optic pathways

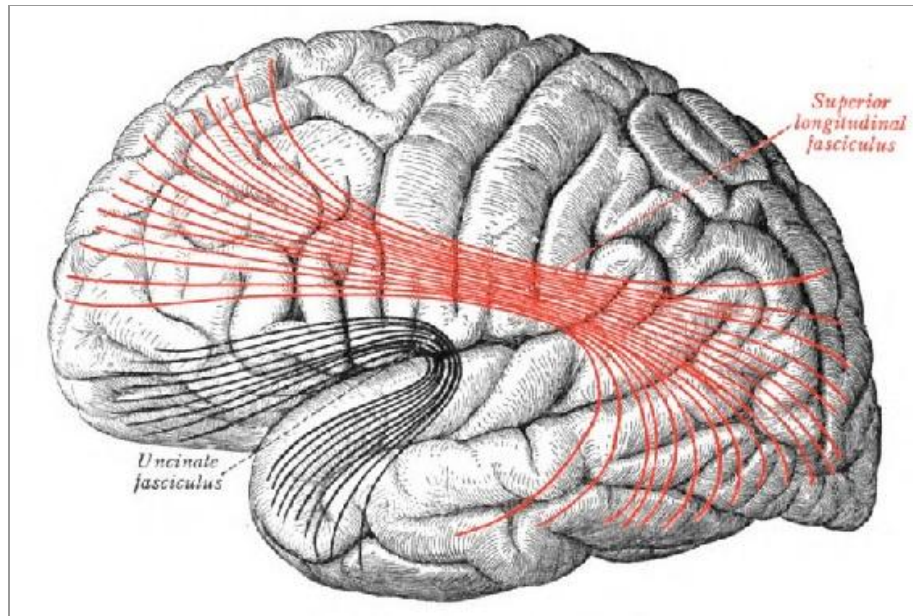


Plate 2[a] · Superior longitudinal and uncinate fasciculi. See Chapter 6 et passim.

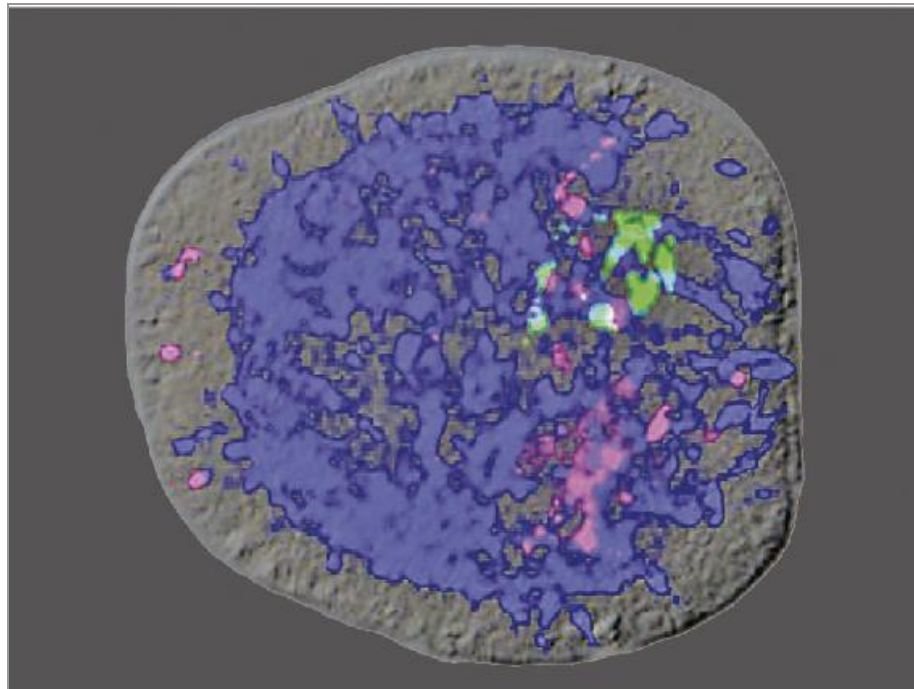


Plate 2[b] · Neural network of *Nematostella vectensis*. Two signal paths, Wnt and BNP, that are instrumental in the centralization of nerve cells in vertebrates, are already asymmetrically distributed in the nerve net of a sea anemone 700 million years old. See Chapter 1.

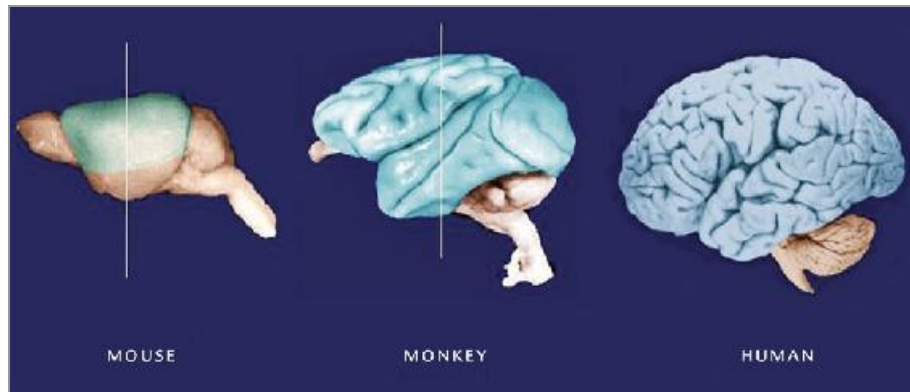


Plate 2[c] · Comparative anatomy of neocortex in mouse, monkey and man. The neocortex is shown in blue-green. See Chapter 1.

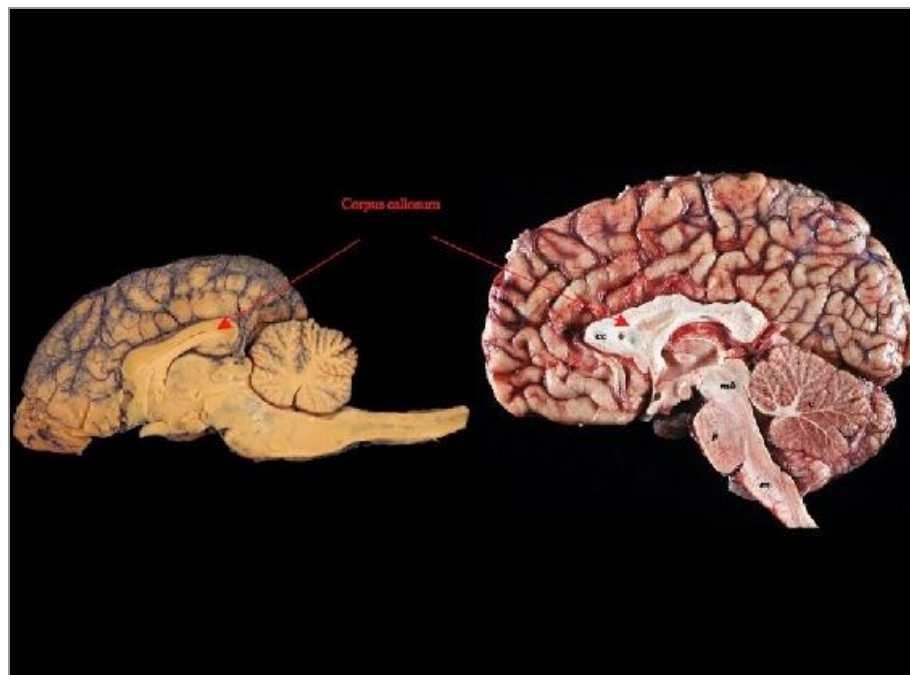


Plate 3[a] · Sagittal section of the brain of a dog and of a human brain (cc = corpus callosum; mb = midbrain; p = pons; m = medulla). Note that the relative size of the corpus callosum has diminished with cortical expansion. See Chapter 1.



Plate 3[b] Simulation of palinopsia/ akinetopsia. See Chapter 2.



Plate 4 · The Garden of Earthly Delights, by Hieronymus Bosch, oil on board, c 1505. Features in common with right hemisphere dysfunction include not merely hallucinatory transformations, harsh dislocations of bodily form, and an emphasis on sharp, penetrating elements, but the isolation of elements, a triumph of disjunction over flow, the rejection of natural harmony of form or colour, and the deluge of detail threatening to overwhelm our sense of the whole. It has been suggested that Bosch suffered from ergotism, a condition caused by eating rye affected by ergot mould, which was accompanied by hallucinations: LSD was first synthesised from ergot fungus. Whether or not this is the case, it is interesting that ergotism would appear to affect more particularly the right hemisphere of the brain (see Senter et al 1976). See Chapter 3.



Plate 5[a] · Hemiprosopometamorphopsia: representation of a patient's perception of faces. See Chapter 3.



Plate 5[b] · Head of a Woman, by Pablo Picasso, oil on canvas, 1960. 'Faces resembled the paintings of Picasso.' See Chapter 3.



Plate 6[a] · The Persistence of Memory, by Salvador Dalí, oil on canvas, 1931. Faces, in the left field of vision, melt away ‘like clocks in a Dali painting’. See Chapter 3.

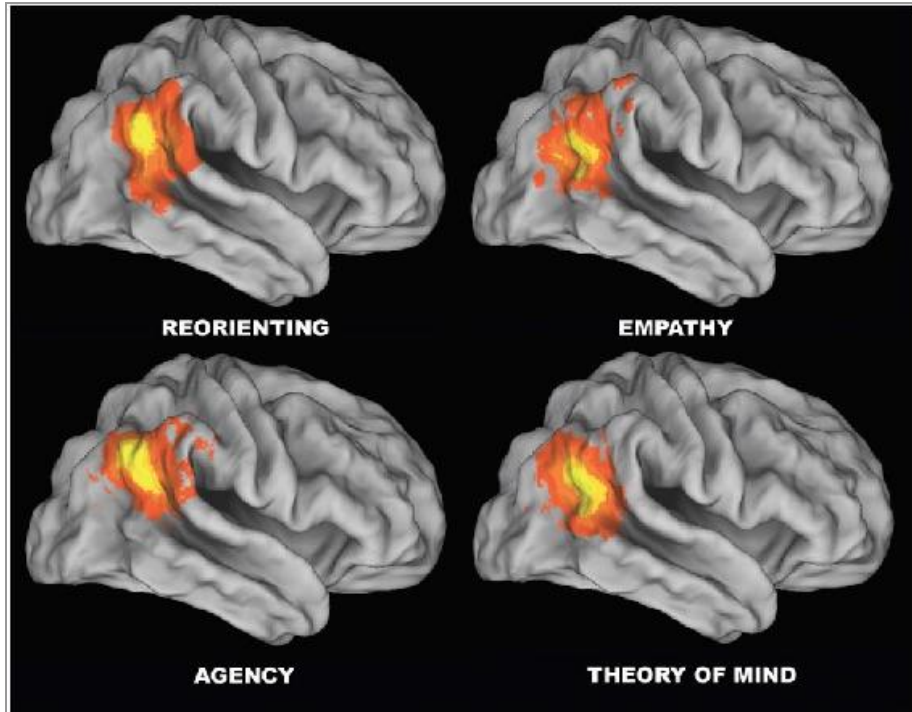


Plate 6[b] The right temporoparietal junction in social interaction (from Decety & Lamm 2007). See Chapter 6.

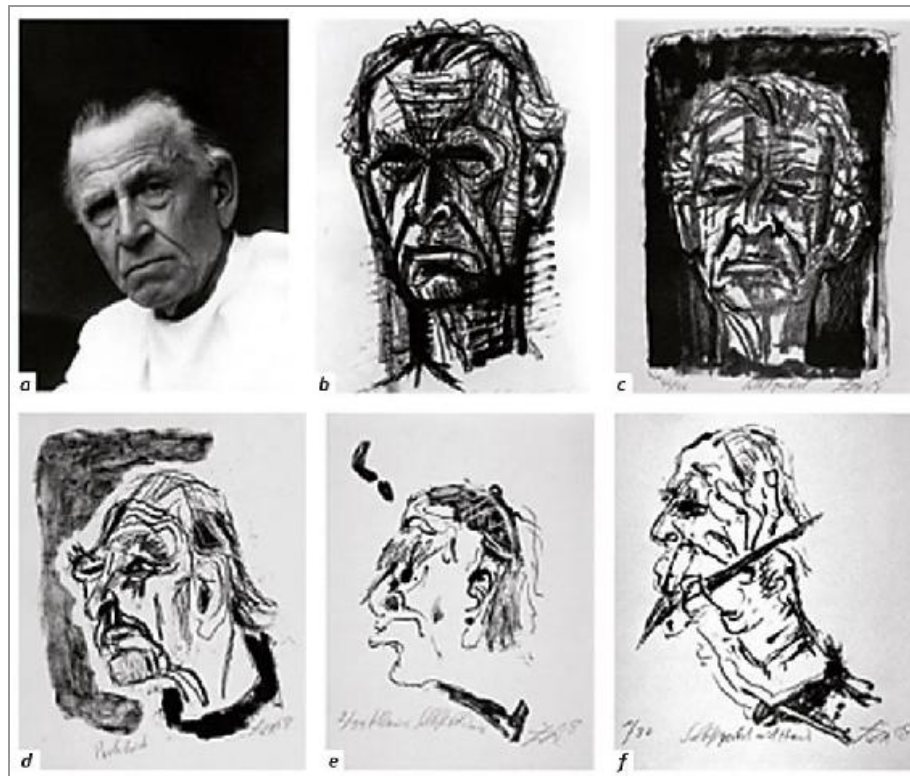


Plate 7 · The top row shows a photograph of Otto Dix, and two self-portraits from before his RH stroke. The bottom row shows three self-portraits from the period after his stroke. By comparison these are sketchy – almost cartoon-like (cf Fig. 20, p 262); they lack vitality, and above all the impression of Dix's character, when compared with the pre-stroke drawings and the photograph. Note in particular that, in the last frame (f), the painting hand obtrudes in the painting and threatens to obscure the face. It also has six fingers, as did the hand in his last selfportrait with his granddaughter, Marcella. See Chapter 8; for supernumerary body-parts, see Chapter 4.

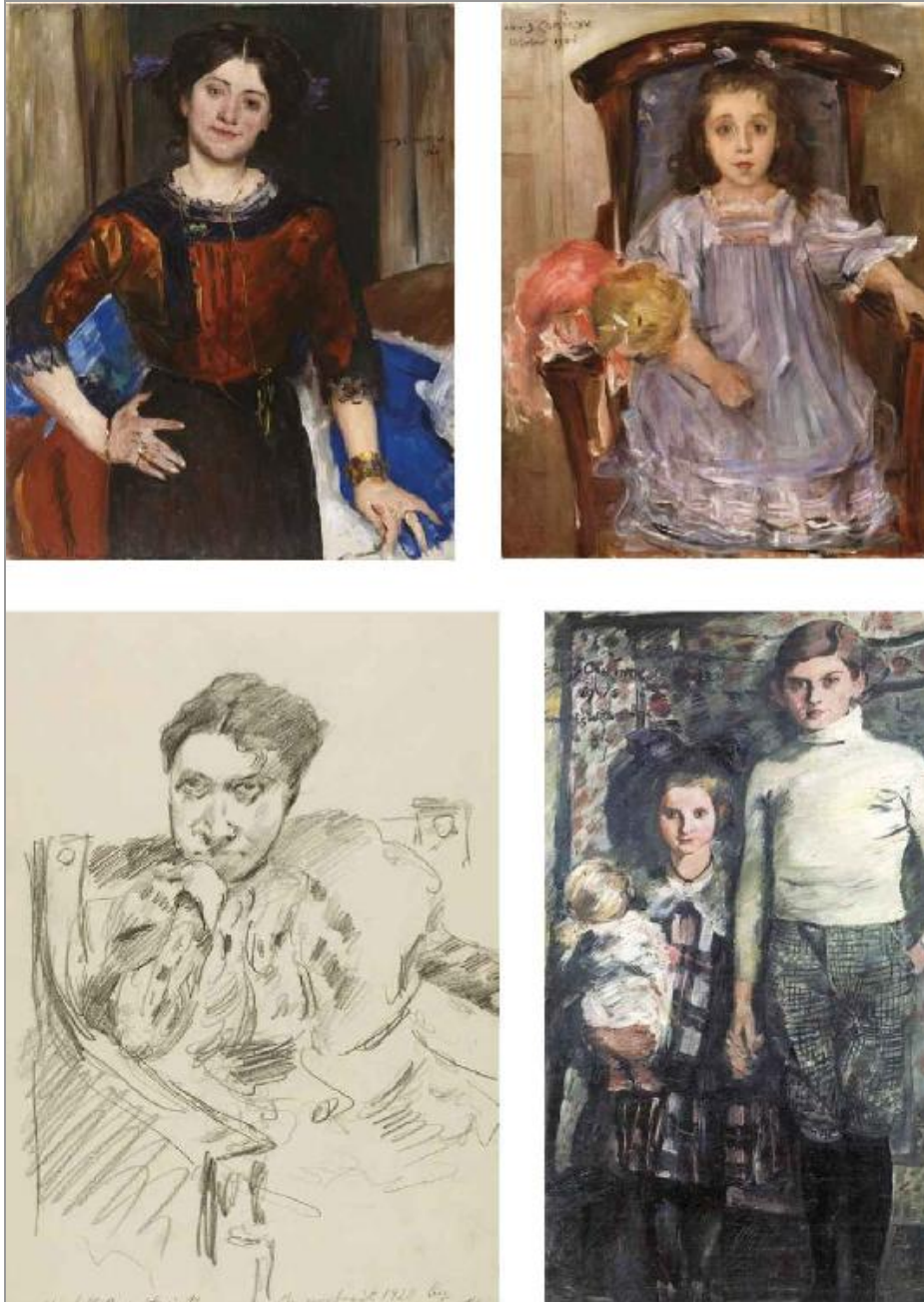


Plate 8 · Lovis Corinth suffered a RH stroke in 1911. Compare (top row) a portrait of his wife in 1910, and of a friend's daughter, Sophie Cassirer, in 1906, with (bottom row) a portrait of his wife in 1920, and of his own children in 1916 (oil on canvas, and graphite on paper).



Plate 9 • Lovis Corinth (continued). Compare, from before his stroke (top row), Laughing girl, 1883, and Black Othello, 1884, with, from after his stroke (bottom row), The beautiful Imperia, 1925, and Mrs Hedwig Berend, 1923 (oil on canvas, and graphite on paper). For discussion, see Chapter 8.

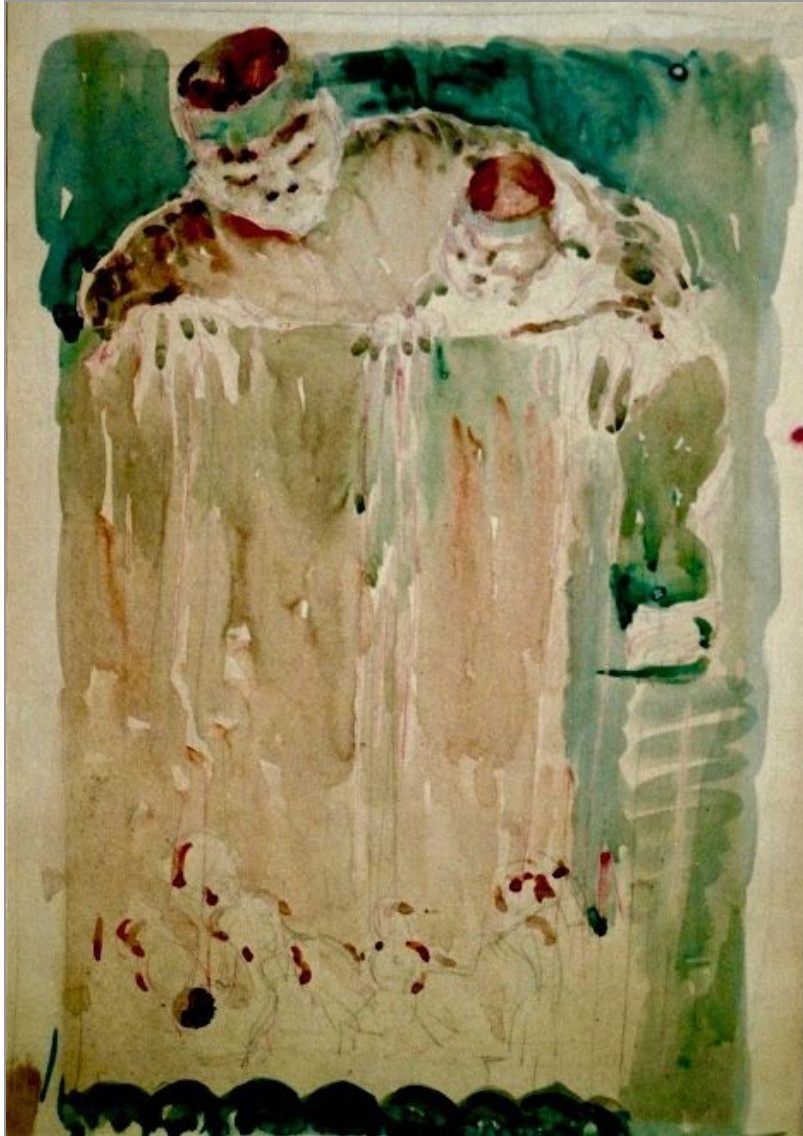


Plate 10[a] · The Puppetmaster (from Bethlem Royal Hospital Archive), anon, watercolour on paper. See Chapter 9.

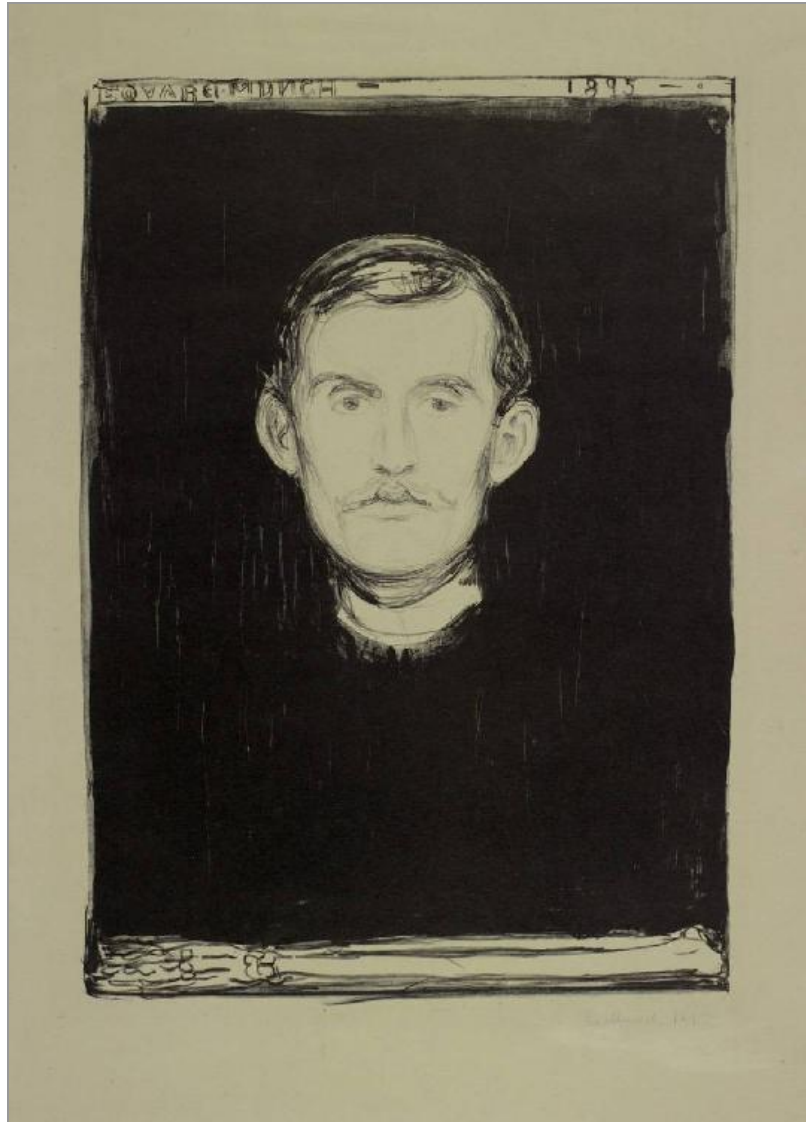
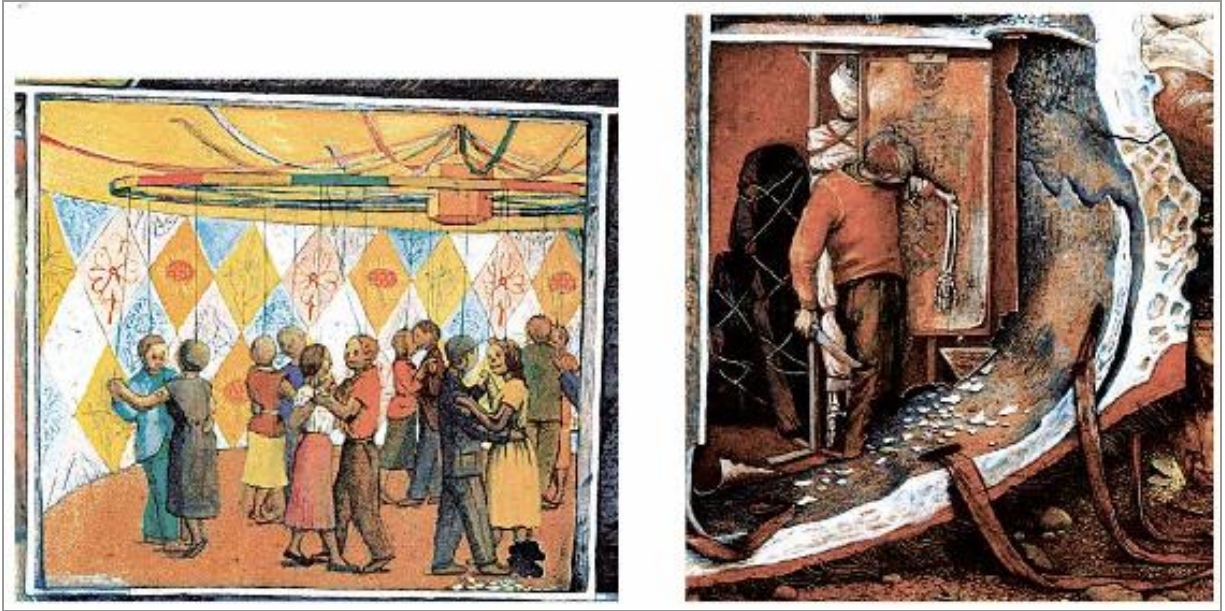


Plate 10[b] · Self-portrait with Skeleton Arm, by Edvard Munch, lithograph, 1895. See Chapter 9.





Enlargements of The Maze, by William Kurelek

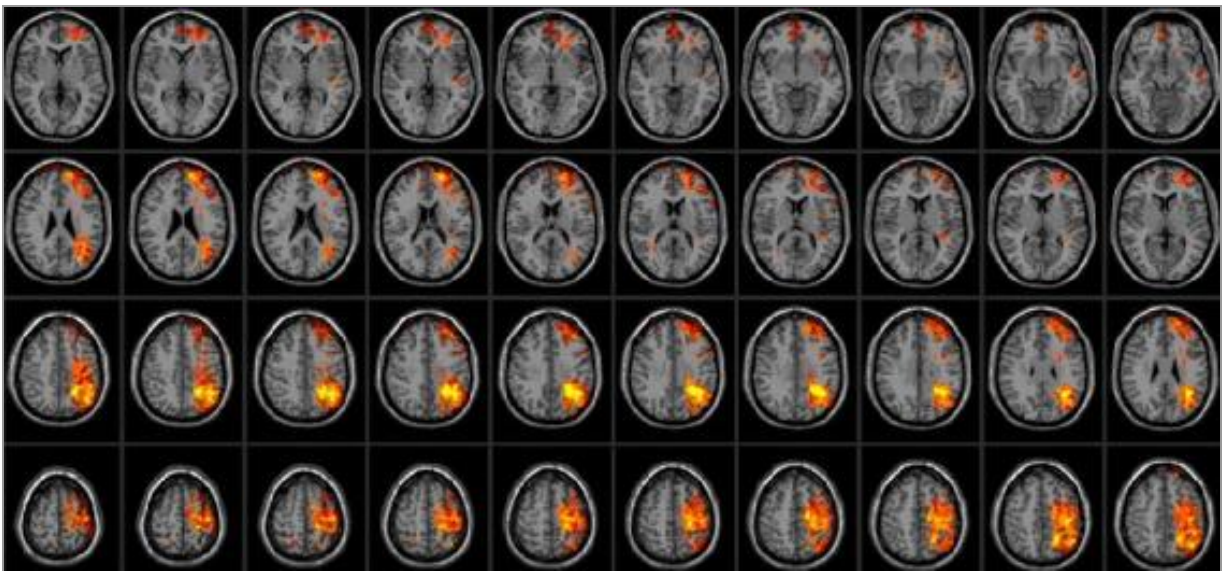


Plate 12[a] · Areas of significance for fluid intelligence. The areas of significance for fluid intelligence are illuminated; as will be seen, they lie almost exclusively in the right hemisphere of the brain (NB the right hemisphere, according to radiological convention, is on the viewer's left). (from Barbey, Colom, Paul et al 2014). See Chapter 7.

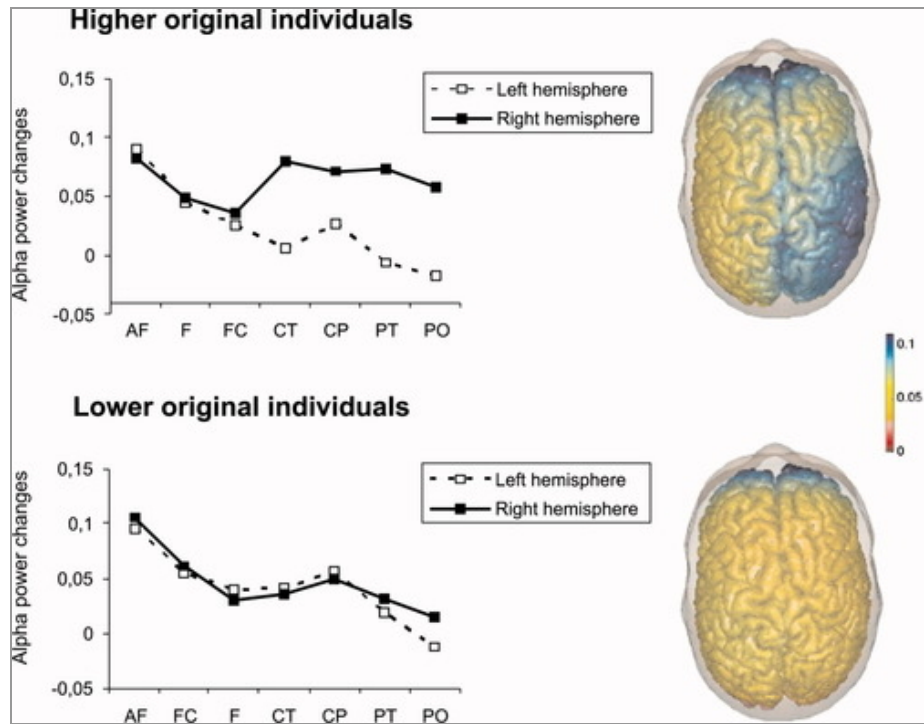


Plate 12[b] · Highly original subjects show stronger alpha power increases in the right posterior hemisphere; less original subjects show no hemisphere difference. (from Fink, Grabner, Benedek et al 2009). See Appendix 1.

Figure 1 THE NEW SIMPLE VIEW : EVERYTHING DOES EVERYTHING

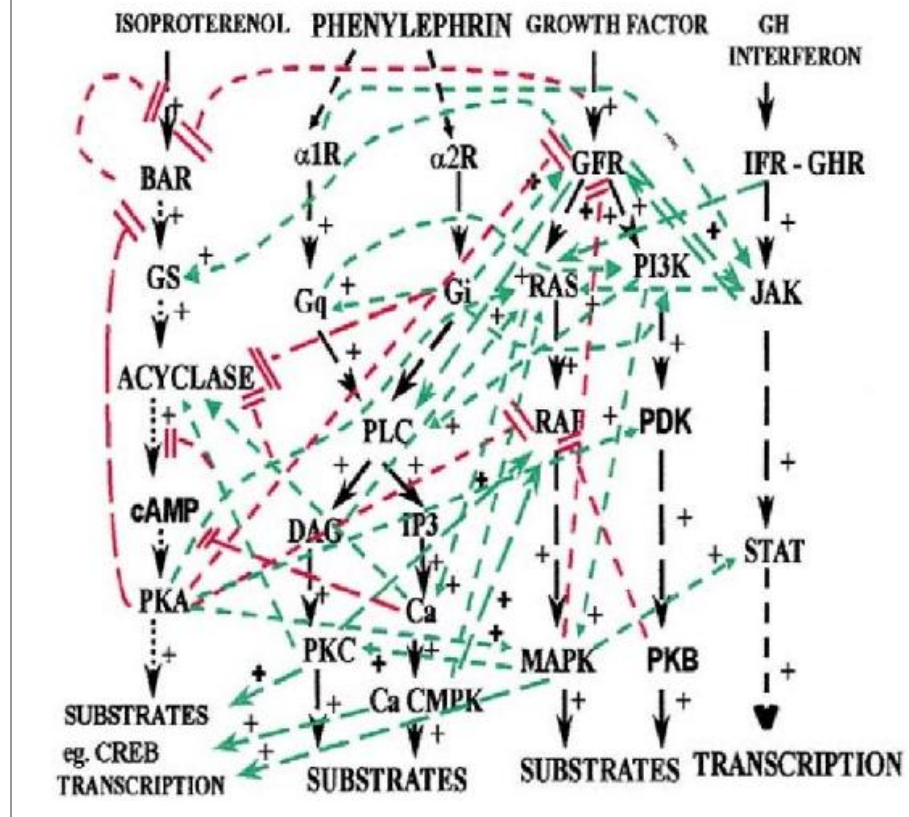


Plate 13[a] · ‘Horror graph’ of the cross-signalling between just five intracellular signal transduction cascades: inhibitory flows in red, facilitatory flows in green (from Dumont, Pécasse & Maenhaut 2001). See Chapter 12.



Plate 13[b] · Eyes of a fly, a frog and a human. See Chapter 12.



Plates 13[c] & [d] · Norfolk Island pine and eagle feathers: note the precision of overall form observed by the needles of the pine and the barbs of each feather. See Chapter 12.

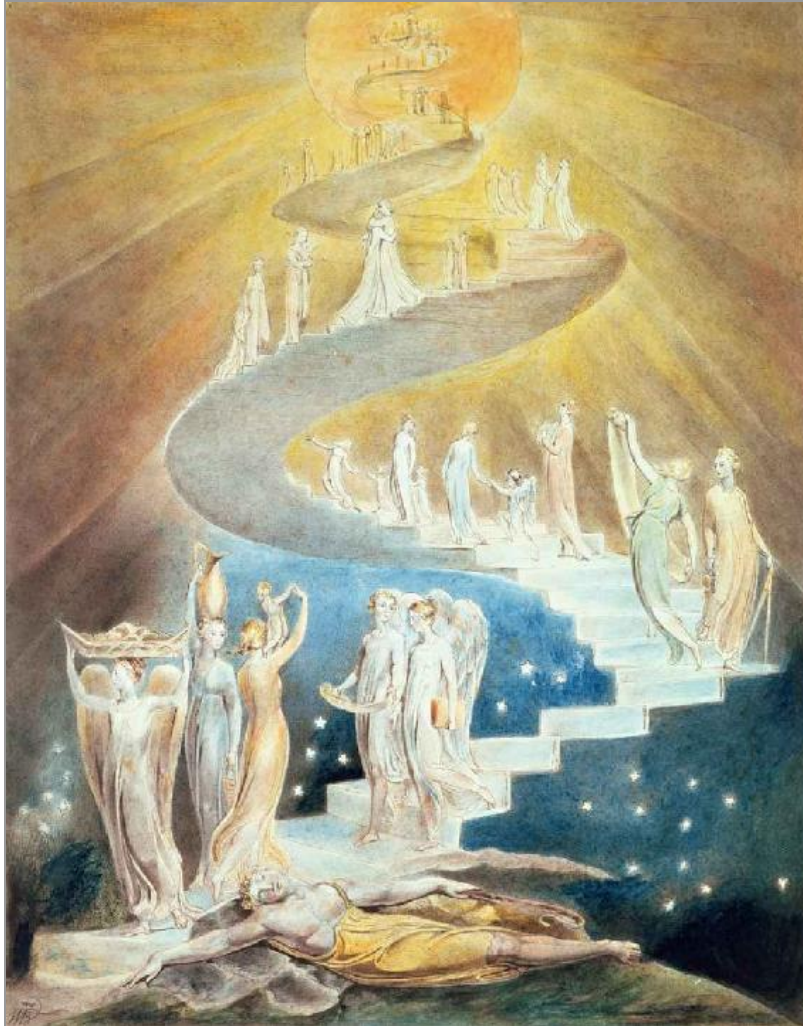
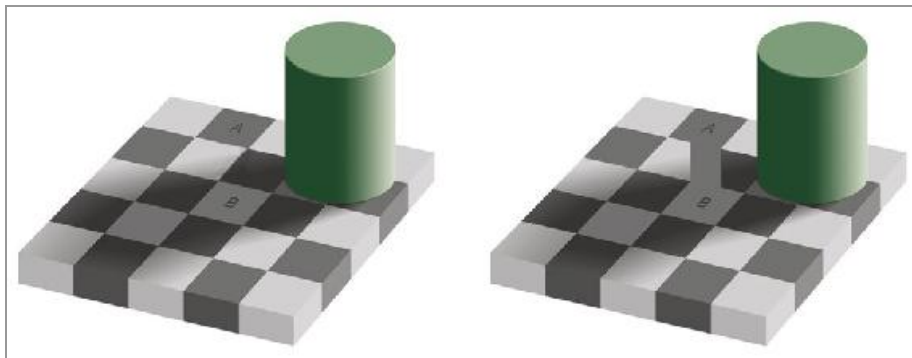


Plate 14 · Jacob's Ladder, by William Blake, pen, ink and watercolour, c 1799–1807. See Chapter 16.



*Plate 15 · La belle captive, by René Magritte, oil on canvas, 1948.
The glow of fire on an area within the frame suggests that this is
neither merely presence, nor merely representation, but, like glass,
a plane that we need to see through. See Chapter 16.*



*Plates 16[a] & [b] · The chequerboard illusion. The image on the
right shows, by the addition of a bar, that A and B are in fact the
same colour. See Chapter 17.*

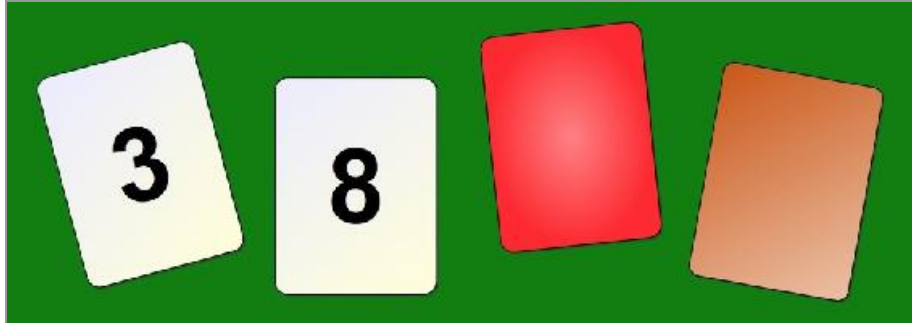
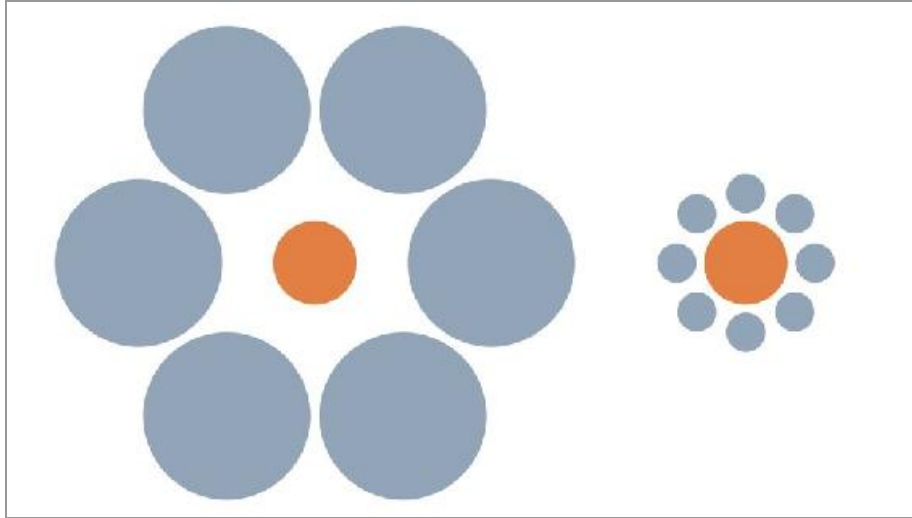


Plate 16[c] · The Wason test (1). Each card has a number on one side, and a colour on the other. Which card(s) must be turned over to test the idea that if a card shows an even number on one face, then its opposite face is red? See Chapter 18.



Plate 16[d] · The Wason test (2). Each card has an age on one side, and a drink on the other. Which card(s) must be turned over to test the idea that if you are drinking alcohol then you must be over 18? See Chapter 18.



*Plate 16[e] · The Ebbinghaus illusion. Context alters perception:
the orange circle is the same size in each configuration. See
Chapter 19.*

THE SCIENCE OF LIFE: A STUDY IN LEFT HEMISPHERE CAPTURE

Movement is the cause of all life.

—*Leonardo da Vinci*¹

It is nonsense to conceive of nature as a static fact, even for an instant devoid of duration. There is no nature apart from transition, and there is no transition apart from temporal duration.

—*Alfred North Whitehead*²

For all bodies are in perpetual flux, like rivers, and parts are constantly entering into and leaving them.

—*Gottfried Wilhelm Leibniz*³

By changing, it remains the same.

—*Heraclitus*⁴

‘IN THE LIVING WORLD, AT LEAST,’ WRITES PHILOSOPHER OF SCIENCE JOHN Dupré, ‘a metaphysics of “things” is hard to sustain.’⁵ Nonetheless it would appear to be the only realm of science in which it still holds sway. While the thinking of physicists has been obliged to jettison many of its old

assumptions, the thinking of most biological scientists does not seem to have kept pace – which is odd, if only because most contemporary biologists seem to believe that biology should be reducible to physics. (I'd say that, while it could never be reduced to physics, it should certainly be compatible with physics.) It has, at least until very recently, been stuck in a mid-Victorian mechanistic vision that physics abandoned over a hundred years ago. Cognitive scientist Donald Hoffman considers this a problem (as do I):

Not only are they ignoring the progress in fundamental physics, they are often explicit about it. They'll say openly that quantum physics is not relevant to the aspects of brain function that are causally involved in consciousness ... They don't avail themselves of the incredible insights and breakthroughs that physics has made. Those insights are out there for us to use, and yet my field says, 'We'll stick with Newton, thank you. We'll stay 300 years behind in our physics.'⁶

The problem is not just that biology has not availed itself of the insights of quantum physics. It's that its dogged adherence to the Newtonian mechanistic model persists in the teeth of the evidence of its incompatibility with the phenomena it is trying to explain. It is an egregious instance, I would suggest, of the sort of thing we have seen before when the left hemisphere insists that its re-presentations provide an adequate and complete account of reality – that a porcupine is a monkey because that's what the theory tells us. And it alerts us to the need to handle science's claims to truth with care.

Please don't get me wrong. I have nothing but respect and admiration for the ingenuity and hard work of my colleagues in the life sciences, and am exhilarated by the ever-growing body of knowledge about the natural world. It manifestly proves itself to be useful in myriad ways and, fairly obviously, my thinking too depends heavily on the broad reliability of recent scientific evidence about the brain and mind. Nonetheless, there is a problem.

Science's view of the world is always shaped by the philosophy it happens to adopt, whether consciously or (more usually) unconsciously. For physicists, as we have seen, it is more or less impossible to avoid

confronting philosophical issues head on. For biologists, however, confrontation with reality is tempered by the nature of their subject matter, which is more forgiving of a fudge. The evolutionary biologist and palaeontologist George Gaylord Simpson remarked that ‘not many biologists are given to exploring the philosophical implications of their science.’⁷ More trenchantly, the theoretical biologist and philosopher Joseph Henry Woodger wrote in 1929 that

physiologists in general never trouble themselves about such things because they suppose themselves to be above ‘metaphysics’ when in fact they are only a very little above it – being up to the neck in it.⁸

As David Bohm commented in the 1960s, it is an odd fact that, just when physics was moving away from mechanism, biology and psychology were moving closer to it. ‘If the trend continues’, he wrote, ‘scientists will be regarding living and intelligent beings as mechanical, while they suppose that inanimate matter is too complex and subtle to fit into the limited categories of mechanism.’⁹ He was not mistaken.

Nonetheless, in the first half of the twentieth century, many philosophically minded biologists, including such eminent British figures as John Scott Haldane and his better-known son, J.B.S. Haldane, as well as Conrad Hal Waddington, moved decisively, like the physicists, away from the machine model. Less renowned, largely by his own choice, but no less distinguished, was Ludwig von Bertalanffy, the great Austrian biologist and polymath who originated general system theory. In 1933 he wrote: ‘we cannot speak of a machine “theory” of the organism, but at most of a machine fiction’.¹⁰

Despite this encouraging development, a more or less abrupt reversion to the seventeenth-century Cartesian model came over the life sciences with the rise of molecular biology, and its language of ‘programmes’, ‘codes’, and so forth, in the twentieth century’s second half. According to Carl Woese, writing in 2004, ‘biology today is little more than an engineering discipline’.¹¹ And Woese was no embittered outsider. His pioneering work revolutionised mainstream biology; he was one of the most influential and widely honoured microbiologists of all time, described by a colleague as

having 'done more for biology writ large than any biologist in history, including Darwin'.¹² But he was disturbed by what he saw.

BIOLOGY AND MACHINES: A MISMATCH OF LANGUAGE

We now live in a world in which everything, including the human brain, is considered to be understandable in the same way – at a hugely different level of complexity, of course, but still in the same way – that we understand a pop-up toaster. ‘Before we can fully understand how our brains work, we need to understand how the parts work’, says Francis Collins, the director of the US National Institutes of Health.¹³ Reasonable enough, you may say – if you assume that ‘fully understanding how our brains work’ is something any scientist should even be talking about. But enquiring after how the ‘parts work’, already imports a host of assumptions, as we have seen. The answers one gets from Nature depend on how one frames the question.

‘There is little doubt about the biologist’s declared obsession with mechanisms of every sort’, writes Stephen Talbott, a philosopher of biology; these include widespread references to

‘genetic mechanisms’, ‘epigenetic mechanisms’, ‘regulatory mechanisms’, ‘signalling mechanisms’, ‘oncogenic mechanisms’, ‘immune mechanisms’, ‘circadian clock mechanisms’, ‘DNA repair mechanisms’, ‘RNA splicing mechanisms’, and even ‘molecular mechanisms of plasticity’ ... no cellular entity or process is exempt; everything has been or will be baptised a ‘mechanism’ ... The odd thing is that I have yet to find a single technical paper in molecular biology whose author thought it necessary to define *mechanism* or any of the related terms.¹⁴

Yet what is even odder is that, having made this ritual obeisance to the machine, biologists carry on to describe the organism in language wholly incompatible with mechanism, a language that would be neither required, nor permitted, in chemistry or physics.

It will no doubt be said by some that such language is just a *façon de parler*, such as when I say that my car engine ‘labours’, or ‘struggles’ to get up the hill in third gear. But that is not an adequate response to the sheer ubiquity, scope and inescapability of such language – or, more significantly,

the nature of the phenomena it is called on to describe. As Whitehead pointed out, 'it is notable that no biological science has been able to express itself apart from phraseology which is meaningless unless it refers to ideals proper to the organism in question.'¹⁵

I would suggest that there are broadly six features that stand out in the language inevitably used by biologists, rather than by physicists or chemists, time and time again, year after year, decade after decade, century after century, Darwin and Dawkins included – language used to describe what they actually see, but which stands in blatant contradiction to the metaphor of the machine. What are they? References to (1) *actively co-ordinated processes*, expressing a sense of (2) *wholeness*, inextricably linked with (3) *values*, (4) *meaning* and (5) *purpose* – each leading separately and together, to the phenomenon of (6) *self-realisation*. None of these get to be applied to my car.

Let me give some examples. First, 'actively co-ordinated processes'. Apart from, directly, 'co-ordinating' functions, processes, developments, and so on, elements of the organism are said to 'regulate', 'control', 'guide', 'induce', 'impose' order on, and at times 'disorder', 'arrange', 'restructure themselves', 'develop', 'adapt', 'respond', 'attempt', 'instigate', 'stimulate', 'inhibit', 'suppress', 'transmit', and 'receive' or 'extract' information from other elements of the whole.

Then 'wholeness'. References to 'rhythm' and 'harmony' aside, elements of the organism are said to 'inherit' information, modes of action or modes of expression, from other organisms from which they are neither structurally nor functionally wholly distinct; they are said to 'exhibit plasticity', involving transformation not of a part or parts, but of the whole; they 'modify themselves', 'integrate', 'unify', 'co-ordinate', 'organise', and 'interpret' *contextually*, that is to say, with regard to the whole organism, not just a part.

Or 'values'. Organisms are normative. They exhibit what is termed 'normal', or 'proper', development; they may exhibit 'errors' or 'mishaps'; 'suffer injury'; engage in 'healing'; attempt 'correction', or instigate 'repair'; perform actions in a 'timely' fashion (or not); exhibit 'aberrant' or 'corrective' reactions; promote 'health', suffer 'disease' and eventually die.

What about 'meaning'? How else to understand the talk of 'giving and receiving information', the 'recognising' and 'interpreting' of signals, the 'distinguishing' of 'relevant' from 'irrelevant' information, the 'adoption',

‘erasing’ or ‘extraction’ of a code, the ability to ‘communicate’, ‘respond’, exhibit ‘intention’, or ‘directed activity’, and the ability to – in some way we do not understand – ‘sense’ that something, some disturbance, say, is present. For example, an influential paper refers, not inappropriately, to ‘decision-making’ by single cell bacteria.¹⁶ I will come onto such decision-making by single cells in due course.

And ‘purpose’? However you may toss her out with a pitchfork, as Horace said, nature hurries back in by the door;¹⁷ and it is impossible to describe the living world at any level without references to aims, purposes or drives. Biological molecular interactions have ‘targets’, ‘recruit’ other molecules for an end, ‘assist’ in processes, ‘aim’ at certain outcomes, have ‘goals’ and ‘achieve tasks’: they act ‘in order to’ secure certain ends by certain means. Single cells are constantly described as ‘behaving’ in certain ways.

Each of these five characteristics singly – and *a fortiori* together – suggests the sixth: a process of ‘self-realisation’. The organism *as a whole* acts in a *co-ordinated* fashion to create and respond to *meaning* in the pursuit of *value-laden goals*, whereby it is fully realised and fulfilled as an organism. ‘Living cells do not operate blindly’, writes James Shapiro, professor in the Department of Biochemistry and Molecular Biology at the University of Chicago: ‘life requires cognition at all levels.’¹⁸

We humans, obviously, exhibit these same qualities, behaviours and purposes. It is conventionally assumed that when we describe them in non-human organisms, we are simply projecting our own onto them. But why? Even in our case, it almost all goes on effortlessly outside of awareness: being aware consciously is not a requirement at any point. The array of descriptors I have just outlined is the same as those we would use in describing a dog’s behaviour at every level, and that includes those of which it is and is not aware, those under its conscious control and those that are not, those in its brain and those in its tail. And the same, *mutatis mutandis*, operates in the case of a frog or a bird. When we see cells within the bird – or the frog or the dog – exhibit the same characteristics as the creature as a whole, why should we make an arbitrary distinction at some level? On what principle and at what point?

You might well be tempted to think that language is one thing, but the actual biological findings another. If you are, read on.

The model of a mechanism, it seems, presents a problem in describing what biologists actually see, otherwise machine language would suffice. And this very fact, in turn, according to Talbott,

immediately raises a suspicion of vitalism in the minds of many scientists. Who, after all, is this organism? And by what special powers does it 'regulate', 'integrate', 'respond', and 'communicate'? Bear in mind, however, that these questions press just as urgently upon the conventional molecular biologist as on the suspected vitalist. After all, the loaded terminology comes straight from the laboratory, where researchers are trying to make sense of what they see ... a lot of experiment and observation has led to this language.¹⁹

If descriptions of organisms cannot avoid the suggestion of meaning, I would like to suggest that that is not because of the inevitably sloppy thinking of generations of highly intelligent, dedicated and observant biologists, but because they are onto something. Organisms are said to perceive or know things because they do: they are said to respond appropriately to changing circumstances, because that is exactly what happens.

Just so that you don't think that speaking of cells as being able to sense, perceive or know is something that no serious biologist could entertain, let me quote Barbara McClintock, the founder of the field of cytogenetics, from her Nobel Prize acceptance speech in 1984:

some *sensing* mechanism must be present ... to *alert* the cell to imminent *danger*... the conclusion seems inescapable that cells are able to *sense* the presence in their nuclei of ruptured ends of chromosomes and then to activate a mechanism that will bring together and then unite these ends, one with another ... the *sensing* devices and the signals that initiate these adjustments are beyond our present ability to fathom. A goal for the future would be to determine the extent of *knowledge* the cell has of itself and how it utilises this knowledge in a '*thoughtful*' manner when challenged ...

We know nothing, however, about how the cell *senses* danger and instigates responses to it that often are truly remarkable.²⁰

Responses that are, as well, sometimes wholly original and in no way pre-programmed – a marker of intelligent response – as we shall see.

Put simply, if you ask biologists explicitly, they will, with a few exceptions, cleave to the machine model; but when you listen to what they are saying, implicitly they abjure it. Yet despite this manifest dissonance at the core of biology today, the machine model is the one that is peddled to children, students, and the general public wishing to learn more about biology, the fascinating study of the nature of life. Any suggestion otherwise is pounced on as evidence of heresy and denounced.

FROM ROBOTS TO COMPUTERS – BYPASSING ALL THAT MATTERS ON THE WAY

‘Today, the genetic program is everywhere’, writes philosopher of biology Daniel Nicholson:

It appears in biology textbooks, such as when organisms are said to be ‘governed by the laws of physics and chemistry as well as a genetic program’.²¹ It is present in the technical literature, such as when claims are made that ‘a cell can be seen as a computer (a machine expressing a program)’.²² And it is also prominently featured in works of popular science. In one of the most memorable phrases of Richard Dawkins’ hugely influential *The Selfish Gene*, organisms are described as ‘survival machines – robot vehicles blindly programmed to preserve the selfish molecules known as genes’.²³ Even some philosophers of biology, who should probably know better, have enthusiastically defended the reality of the genetic program.²⁴

And Nicholson adverts to an egregious example:

The genes program the embryo in the same way that the hardware in an automobile assembly plant’s robots’ central processing units realize a program that enable [*sic*] them to weld chassis without human supervision and more accurately than any human can perform this task. This latter thesis requires no philosophical defence. It is obvious to anyone who examines the available accounts of the embryological development of, say, the *Drosophila* [fruit fly].²⁵

There are many problems with this (and some of them, as I will show, are illuminated precisely by examining the development of *Drosophila*). ‘In reality’, writes Nicholson, ‘DNA is only functional when it is embedded in the context of an already present, intricately organized cell’:

It is only in the presence of a pre-existing cellular apparatus that any talk of ‘gene action’ can even make sense. And what is more, the origin of that cellular apparatus cannot be traced back to the genes ... many cellular structures such as membrane-bound organelles, as well as the plasma membrane itself, are the only template for their own replication; that is, they are the only source of ‘information’ for their own three-dimensional structure.²⁶

And the distinguished Harvard geneticist Richard Lewontin comments:

Genes are said to be ‘self-replicating’, they engage in ‘gene action’, they ‘make’ proteins, they are ‘turned on’ or ‘turned off’ by ‘regulatory’ DNA. But none of this is true ... Genes ‘do’ nothing, they ‘make’ nothing ... DNA is among the most inert and nonreactive of organic molecules.²⁷

Indeed, it’s not just what genes don’t ‘do’: it’s what they don’t ‘know’. There is not anything like the necessary set of instructions in them. ‘It is commonly stated that the genome incorporates a *Bauplan*, an architectural plan or blueprint of the body’, writes immunologist Werner Müller in his classic textbook, *Developmental Biology*. ‘Actually, this is not the case: the genome is not a sketch or design of the finished body.’²⁸

Many, many other elements than the genotype go to make the phenotype – the organism we can see. As well as DNA, it is obvious that chromatin, RNA, cellular signalling pathways, selective modes of protein translation, and the membrane architecture of the cell all contribute, for a start. The proper response to the news that we share 98–99% of our genes with a chimpanzee, or 50% with a banana, is not that we must be barely distinguishable from chimps and not far from being bananas, but that the determining role of genes *as such* is more limited than we thought.²⁹

Please note, I am not for one moment denying the importance of heredity: it is very important indeed. I am merely suggesting that it is far more complex than we are led to believe. You cannot consider *genes* in isolation from many other aspects of the organism. ‘Genetic change’, writes Shapiro, himself a geneticist, ‘is almost always the result of cellular action on the genome.’³⁰ Not, then, solely, or even principally, the action of the

genome on the *cell*. But more importantly, heredity is more than genetics: it passes from whole organism to whole organism, not just via DNA – exactly how, we do not know.

It is quite impossible for genes to ‘programme’ the making of an embryo. For a start, there is nowhere near enough information contained in genes. Consider the human brain, never mind the whole human body. With an estimated 100 billion neurones, a quarter of a million of them are created on average during every *minute* of the nine months of gestation, at times more. Each of these neurones, needless to say, must then make thousands of connexions with other neurones, and all this must end up in a minutely specific, hugely complex architecture with every part of the whole in exactly its required location. Where was that information in the ‘programme’ that DNA is said to enshrine?

We have an estimated 26,000–30,000 genes (what counts as a gene is not a cut and dried matter, but to a certain extent a human convention, and involves elements of judgment). But a blind, millimetre-long roundworm, *Cænorhabditis elegans*, with only 959 cells in total already has over 19,000. Indeed the pea aphid has 34,600 genes; and *Daphnia pulex*, a water flea common in lakes and ponds around the world, and about the size of a full stop on this page, has 39,000.³¹ A species of amoeba has the largest recorded genome, 670 billion base pairs, roughly 200 times the size of the human genome.³²

And then, only a tiny fraction, about 2%, of our DNA consists of exons, those regions of a gene that actually contain the information required to encode a protein.³³ With 1,200,000 proteins being produced, it is quite clear that any one gene must code for many different proteins, depending on the context.³⁴ The ‘same’ DNA proteins, with the same amino acid sequences, can, in different environments, ‘be viewed as totally different molecules’, with distinct physical and chemical properties.³⁵ Protein synthesis is subject to epigenetic influences to such an extent that the same gene ‘blueprint’ can create 2,000 or more variations.³⁶ Epigenetic changes are those that are acquired during the lifetime of individuals – from particular experience – and alter gene expression in any one of a number of ways in the next generation. This means that evolution is much smarter than often portrayed. It doesn’t have to wait millions of years, drumming its fingers, waiting for randomness to catch up with experience.³⁷

The other 98% of the genome used to be referred to as junk DNA, because it seemed meaningless, consisting of endlessly repeated sequences that code for nothing. These sequences are no longer considered junk, simply by deduction from the fact that they make a difference – but how they make a difference is not yet known.

Indeed, what is a gene? According to the geneticist Rick Young at MIT, when he first started teaching in the mid-1980s it took him about two hours to teach raw undergraduates what a gene was and how it worked. Today he and his colleagues need three months of lectures to convey the concept of the gene to graduates. Karola Stotz and Paul Griffiths collected 14 atypical but real genetic arrangements and asked biologists to decide whether each represents one, or more than one, gene.³⁸ For example, in one case a protein is assembled when four different RNA molecules, made from DNA scattered over 40,000 base pairs, are assembled into one transcript. They found that though the biologists were fairly evenly split, ‘hardly any confess that they don’t know’.³⁹ Instead of discrete genes mass-producing identical RNA transcripts, ‘a teeming mass of transcription’ converts many segments of the genome into multiple RNA ribbons of differing lengths. Some of these transcripts come from regions of DNA previously thought not to contain protein-coding genes. The genome contains many overlapping transcripts, genes within genes, and even genes that seem to be controlled by regulatory regions from another chromosome.⁴⁰ ‘Discrete genes are starting to vanish’, according to Roderic Guigó, Director of the European Research Council’s Centre for Genomic Regulation.⁴¹

In sum, the extraordinary fidelity and robustness of organismal development is not attributable to a programme, an algorithmic sequence of predetermined steps that must be carried out in a certain order, as with a machine. The cell is constantly monitoring, promoting, inhibiting (including, as necessary, inhibiting its inhibitors), repairing, splicing and rewriting DNA. Each ‘step’, as we are accustomed to think of it, is not computed from the immediately preceding one, but is part of a process in which information comes from many sources, a process that can’t properly be thought of as decomposable into steps at all. The development of an embryo requires an unimaginably intricate series of local interactions, not specifiable by a single global control mechanism. ‘The genetic program does not explain development’, writes Nicholson; ‘it merely black boxes it’:

Embryogenesis is much too complex and much too reliable in its outcome to be specified by a program. If development were a program, the fertilized egg (not to mention the genome) would never succeed in computing its output.⁴²

That a purely deterministic programme would be prone to error might seem counterintuitive; but when one takes into account the degrees of freedom involved in the process when compared with the rigidity of a manmade machine, and the degree of complexity involved in constructing an embryo, it becomes apparent. Dupré explains why any such deterministic programme would fail, using an analogy. He points out that the precision with which fantastically complex processes are carried out, often by different paths on different occasions and under different circumstances, necessitates an overall goal, not a set of deterministic steps – which would be far too likely to go wrong:

If I ask someone to go to the shop and buy me a loaf of bread, and they agree, I am fairly confident that the outcome will be as I intend. If I provide a deterministic programme – take 12 paces north-west, raise hand, turn knob, push, etc, there are too many unanticipated interventions that can derail the process for me to have much hope of success. Teleology is much better than deterministic causation at getting things done, and development is much too reliable to be seen as anything but teleological.⁴³

I will return to teleology in due course. Certainly, the levels of accuracy achieved in the replication of the genome are awe-inspiring and attest to a complex and active process of monitoring of the genome by the cell, resulting in a three stage programme: (i) selection of the correct DNA nucleotide by the replicative DNA polymerase; (ii) removal of any mis-inserted nucleotides by a proofreading activity associated with the polymerase; and (iii) post-replicative correction of polymerase errors that have escaped proofreading by the DNA mismatch repair system.⁴⁴ This reduces errors in the transcription of an entire genome of 3 billion base pairs from a few million to less than 1. This is achieved not by the genome but by the *system as a whole* operating at several levels. According to the

biologist Denis Noble, ‘the order at the molecular (DNA) level is actually imposed by higher level constraints’.⁴⁵ Top-down causation is not supposed to happen in the reductionist model.

Nicholson speaks of the genetic program not explaining development, but merely ‘black boxing’ it. Current biology is littered with such ‘black boxes’. Take the concept of ‘emergence’: it is a perfectly useful term for pointing to what Bergson called creative evolution – the extraordinary coming into being of completely novel qualities as a system grows in complexity. The problem arises when we use it not just to point, but as though offering an explanation. This is like Molière’s doctor grandly explaining that opium makes one sleep because of its ‘dormitive properties’. Speaking gravely of emergence is fine as long as you do not imagine you have explained anything thereby. You have merely sidestepped another problem for reductionism. The rabbit ‘just did’ emerge from the hat. What was to be explained has just been rephrased, and *voilà* – another mystery solved.

The idea that the development of an individual organism is the unfolding or execution of a genetic program suggests a kind of simultaneous myopia and tunnel vision, lacking both depth and breadth of insight. As Levins and Lewontin point out,

The organism is the consequence of a historical process that goes on from the moment of conception until the moment of death; at every moment gene, environment, chance, and the organism as a whole are all participating ... Natural selection is not a consequence of how well the organism solves a set of fixed problems posed by the environment; on the contrary, the environment and the organisms actively co-determine each other.⁴⁶

The shape that an organism takes emerges from its own physiological states, as much as from genes, and these are as much under the influence of apparently ‘foreign’ organisms as of the organism itself. Referring to the impossibility of distinguishing neatly the intestines from their exceedingly numerous and complex inhabitants, biologist J Scott Turner points out that ‘it is physiology more than genetics that forges the designed gut.’⁴⁷

Even within the organism, genes are only one part of a bigger picture. The cell context – which so radically changes the way in which DNA will act, and which itself reads, interprets, and deploys, according to need, whatever there is in the DNA to read – is not itself specified by the DNA. ⁴⁸ The assumption that it would be like Chomsky asserting nonsensically that language springs from the child's brain without interaction with the environment. Philosopher of science Richard Burian writes:

Without knowing an enormous amount about the contexts in which a sequence and its products are placed – contexts that vary enormously in ways that cannot be predicted from complete knowledge of the genome – there is, in general, no determinate answer to the question, 'What does this sequence of nucleotides do for this organism?' Thus, if one tries to proceed strictly from the genome up, one cannot predict, in general, what effects sequence-identified genes will have on the organism and how they will affect its fitness. ⁴⁹

DNA is itself a complex that is twisted in three-dimensions in a way so intricate, and economic in achieving multiple ends simultaneously, that it almost defies belief, so as to promote, bring together, or alternatively shelter from contact, regions of the molecule and their encoding capacity. The structure and its manipulation are at least as informative as the string of DNA itself. The molecule is a three-dimensional entity, not just an abstract two-dimensional string of symbols such as a computer might read, a fact which tends to be overlooked when speaking of 'code'.

The cell nucleus, which is around six millionths of a metre in diameter, contains two metres of DNA, a feat which is 'geometrically equivalent to packing 40 km (24 miles) of extremely fine thread into a tennis ball.' ⁵⁰ That's not all, since the 46 separate chromosomes (each averaging, if we continue the analogy, the equivalent of over half a mile long), have to be kept distinct and functional, not hopelessly entangled.

Enzymes known as topoisomerases, whose task is to help resolve complexities in the over-winding or under-winding of the chromosome, demonstrate 'a spatial insight and dexterity that might amaze those of us

who have struggled to sort out tangled masses of thread’, comments Talbott. He continues:

these enzymes manage to make just the right local cuts to the strands in order to relieve strain, allow necessary movement of genes or regions of the chromosome, and prevent a hopeless mass of knots. Some topoisomerases cut just one strand of the double helix, allow it to wind or unwind around the other strand, and then reconnect the severed ends. This alters the supercoiling of the DNA. Other topoisomerases cut both strands, pass a loop of the chromosome through the gap thus created, and then seal the gap again. (Imagine trying this with miles of string crammed into a tennis ball!) I don’t think anyone would claim to have the faintest idea how this is actually managed in a meaningful, overall, contextual sense, although great and fruitful efforts are being made to analyse isolated local forces and ‘mechanisms’.⁵¹

Don’t forget that this is not something that DNA itself can programme: it depends on the interaction of a large number of factors. Even then, according to a genetics research group at Holland’s Hubrecht Institute,

not only active, but also inactive, genomic regions can transiently interact over large distances with many loci in the nuclear space. The data strongly suggest that each DNA segment has its own preferred set of interactions. This implies that it is impossible to predict the long-range interaction partners of a given DNA locus without knowing the characteristics of its neighbouring segments and, by extrapolation, the whole chromosome.⁵²

Note, the *whole* chromosome: and not only that, but the *whole* cell. And ultimately the whole organism. None of this is reminiscent of how a machine works, nor is any of a whole bunch of factors I will now come on to consider.

In doing so, I have been enormously inspired by, and am greatly indebted to, the illuminating work of philosophers of science John Dupré and Daniel Nicholson – especially, but by no means only, by their edition of

a collection of papers by over 20 scientists and philosophers, the most thorough examination of processual philosophy in relation to biology to date, *Everything Flows: Towards a Processual Philosophy of Biology*, which the editors generously allowed me to read ahead of publication.^{[53](#)}

WHY ORGANISMS ARE NOT MACHINES

1. On-off

First, a machine is static until switched on, and may be switched off without ceasing to exist. Organisms, as Nicholson points out, much like waterfalls or tornadoes, do not have an off switch.⁵⁴ The very existence of an organism is, from beginning to end, one unceasing flow of matter and energy. For it to stop, even for an instant, would mean immediate death. As J.B.S. Haldane put it, using the image of fire – pure energy – rather than water, ‘a flame is like an animal in that you cannot stop it, examine the parts, and start it again, like a machine. Change is part of its very being.’⁵⁵ As he hints, analysis – examining its supposed ‘parts’ – would stop it and kill it. Yet the biologist endlessly, and for some purposes necessarily, relies on taking slices from the seamless flow of life. Just consider the conventional anatomical techniques (anatomy, the study of living form, literally means ‘cutting up’) for examining nature: dissecting, slicing, desiccating, pickling, staining, fixing, and freezing, not to mention vivisection.⁵⁶ Organisms may be taken apart, but they are not put together; they are not made –they become. And such entities as we can identify (genes, molecules) cannot take precedence over the relationships which *go to constitute them*.

In biology all is becoming, never just being:

in the biological world, at least – activity and being necessarily presuppose one another. Being is neither ontologically nor temporally prior to activity, as the very existence of living beings is only possible by means of continuous activity.⁵⁷

No machine model can make sense of this, since a machine must be built before it can be set in motion. This alone should alert us to its misleading nature. The machine, the thing, takes priority over the process: it comes first in time, and its existence grounds what it does. For living beings – perhaps they should be called living ‘becomings’ – this is not the case:

they are what they do, and come into being through their very movement. In this they are like streams that flow. Their being, their form, their becoming, is their movement; and their movement is their being.

2. Motion vs stasis

This leads seamlessly to the next obvious distinction. What has to be explained about a machine is how it changes at all. This is because it is a system that exists close to dynamic equilibrium. When power is applied, one otherwise static and self-contained component transmits energy to another static and self-contained component, and so on, in a linear chain. Then it is switched off, and it returns to equilibrium, where it can remain indefinitely.

In an organism, by contrast, what has to be explained is, not how it changes, but how it *remains stable*, despite constant change on an unimaginable scale. The stable continuance of a stream is owed to change. It depends on the flow of water molecules through it, entering and passing on elsewhere, and if the water ever stopped steadily flowing and replacing itself the stream would cease to exist. In this way, as Nicholson points out, the idea of an organism as a stream of life rather than a machine captures two essential and complementary elements: ‘the continuous exchange of matter that defines metabolism on the one hand, and the stability of form that is maintained in spite of it on the other.’⁵⁸

If we pay attention to what is disclosed by biological organisms, we cannot but see process and flow at its core. ‘Whatever else organisms may be, what cannot be denied at an ontological level is that they are stable metabolic flows of energy and matter.’⁵⁹ We know this intuitively. Most of the cells in your body were not there a few years ago: the form of the flow has persisted, but its original substance has utterly vanished. As the German poet Novalis observed in the late eighteenth century, ‘there is no doubt that our body is a moulded river’.⁶⁰ But this is not an intuition only. It is the best metaphor we have for the proper physiological understanding of living tissue. John Scott Haldane saw organisms as highly dynamic eddies of matter, which nonetheless had the power to remain stable over time – not things, but stabilised *processes*: ‘they are constantly taking up and giving

off material of many sorts, and their “structure” is nothing but the appearance taken by this flow of material through them.’⁶¹

Structure is the static element we illegitimately extrapolate from the flow of time. Individual organisms, and the evolutionary process in which they inhere, are *extended* in time – not a sequence of timeless structures, without extension, that replace one another. Structure is function once time has been excluded; function is structure once included in time.⁶²

Moreover, in as much as the organism can be said to have ‘fixed’ structures at all, they are themselves as much the *result* of flow, as the *cause* of it. Biologist Craig Holdrege gives this thought-provoking example, from human foetal development:

Before the heart has developed walls (septa) separating the four chambers from each other, the blood already flows in two distinct ‘currents’ through the heart. The blood flowing through the right and left sides of the heart do not mix, but stream and loop by each other, just as two currents in a body of water. In the ‘still water zone’ between the two currents, the septum dividing the two chambers forms. Thus the movement of the blood gives the parameters for the inner differentiation of the heart, just as the looping heart redirects the flow of blood.⁶³

Above I mentioned that change in a living organism takes place on an unimaginable scale. Let me give some idea of that scale. There are an estimated 37.2 trillion cells in the human body.⁶⁴ Each one of these cells performs many millions of complex reactions every *second*.⁶⁵ In doing so the cell does not act atomistically but within complex feedback systems with other cells. Biological enzymes promote extraordinary rates of change. In the absence of catalytic enzymes, the decarboxylation of amino acids would proceed with a typical half-life of about a billion years: in the presence of enzymes these half-lives are reduced to less than a thousandth of a second.⁶⁶ And a single molecule such as carbonic anhydrase – of which the body contains unimaginable numbers – can catalyse upwards of a million reactions per second.⁶⁷ Each protein may combine with ‘several hundred different modifier molecules, leading to practically infinite combinatorial possibilities’ and each ‘protein itself is an infinitesimal point

in the vast heaving and churning molecular sea of continual exchange that is the cell'.⁶⁸

One research team writes that in an organism we see a collaborative process that can be 'pictured as a table around which decision-makers debate a question and respond collectively to information put to them.'⁶⁹ But if that is the case, we must remember that, as Talbott points out,

the collaborative process mentioned above involves not just one table with 'negotiators' gathered around it, but countless tables with countless participants, and with messages flying back and forth in countless patterns as countless 'decisions' are made in a manner somehow subordinated to the unity and multidimensioned interests of the organism as a whole.⁷⁰

The human organism, it is clear, exists in a state of stable, patterned flux that we cannot even begin to conceive.

All living things metabolise, that is to say exist in a constant energetic exchange with their surroundings. The word 'metabolism', from Greek *metabolē*, means simply 'change'. Homeostasis, growth, and reproduction are the three most fundamental characteristics of cells and all living things – and they are all processes.⁷¹ 'One decisive reason for taking organisms to be processes', writes Dupré, is that they are

open systems that must constantly exchange energy and matter with their surroundings in order to keep themselves far from equilibrium. The persistence of an organism is dependent on its ability continuously to maintain a low-entropic 'steady state' in which there is a perfectly balanced import and export of materials. When this exchange ceases, the steady state is irretrievably lost and the organism succumbs to equilibrium, resulting in death ... You can leave your typewriter in an empty loft and return a decade later and start using it again. But if you accidentally leave your hamster in the loft, you will not have a hamster for very long.⁷²

At the cellular level, Dupré points out, 'the persistence of the human organism over the life cycle requires an almost inconceivably precise

balance of division, differentiation and destruction of cells.’⁷³ And at the molecular level, according to biochemist Ross Stein, proteins are not inert, but ‘dynamic entities that negotiate complex energy landscapes’.⁷⁴ Biochemistry, the chemistry of life, is endlessly dynamic, changing, creating, repairing, transforming. ‘The great challenge for the life sciences today’, writes Shapiro,

is to understand how all the regulatory processes and control circuits operate to make indescribably complex reproductive, repair and morphogenetic processes come out right in the face of changing circumstances.⁷⁵

To the left hemisphere’s linear habit of mind, and its predilection for ‘things’, there is something paradoxical about stability depending on change. But the joint action of two forces tending to counteract one another is one of the best recipes for stability, found throughout the natural world: it is the essence of homeostasis.⁷⁶ Examples are everywhere in animal and human bodies, in the regulation of temperature, blood pressure, muscle tone, hydration, cell renewal, and many, many other equilibria, which are stable because they are dynamic, not static (the balanced functioning of the asymmetrical brain, being, of course, another): they involve the harmony of opposing tendencies. A tightrope walker balances by making and responding to myriad tiny movements in the rope: completely stabilise the rope and the performer falls off. (Equally let it go too slack and the same happens.) The right hemisphere view is more inclusive than that of the left: stability can be explained by dynamism alone, but dynamic processes cannot be explained by static ‘things’ alone.

One very important element in all life is, of course, evolution. Many problems arise from seeing evolution as effectively the replacement of one element (a species) by another: as a chain, not a flow. ‘Organisms do not, of course, evolve’, writes Dupré. ‘Evolution relates to the distribution of the properties of organisms over time.’⁷⁷ Evolution is a flow that seamlessly connects all life. What seem like species are just our way of reifying that flow (‘thingifying’ it) at any one moment in time. As geneticist Charles Birch put it, ‘nuts and bolts cannot evolve! They can only be rearranged.’⁷⁸

Life is not a rearrangement of already known nuts and bolts, but the constant creation of something radically *new*.

Once one understands that one is dealing with flow, natural selection can be seen for what it is: a *stabiliser, not an agent of change*. Indeed, and fairly obviously, natural selection is never the originator of change at the gene level; it acts only to stabilise an already existing change. By selecting the most adaptive phenotypes, the lineage is stabilised over longer periods of time.⁷⁹ Equally, as we shall shortly see, genes are not stable elements in the story, unchanging unless by blind accident: they are themselves constantly changing or being changed, in highly adaptive ways.

3. Non-linearity

A serious problem for adherents to the machine model is that, while they are obliged by the model to explain organisms from the bottom up only, the deeper they go the less of anything remotely machine-like can be found. The scarcely material entities that physicists have grappled with over the last hundred years offer little reassurance that, if only we go to a more basic level, we are going to find a mechanism. As the biologists try to account for mind in purely material terms, physicists have increasingly been inclined to account for matter by appealing to mind.

However, long before we get down to the quantum level, things show no signs of getting simpler: they remain stubbornly as complex and animate as we go down in scale.

Here I'd like to pick up the observation that no organism develops as the result of the execution of a sequence of predetermined steps. Each developmental 'step' is not simply computable from the immediately preceding one. In a classical mechanism, causation is linear and can be clearly outlined. However, in biological systems, causation tends to follow not straight lines, but spirals, involving recursive loops, and multiple causes leading to multiple effects across a network, with sometimes competing factors cross-regulating one another, reciprocally interacting, and in ways we do not understand taking information from the whole. All this makes the classic idea of a two-element, cause and effect sequence unhelpful. 'The standard two-event model', according to philosophers of science Rani Lill Anjum and Stephen Mumford, 'does not handle this complexity well,

offering us just more and more of the same discrete two-events causally related.’⁸⁰ A mechanism, in other words.

The geneticist Philip Gell, speaking about his area of research, considers that ‘the heart of the problem lies in the fact that we are dealing not with a chain of causation but with a network’, something like a spider’s web, in which a perturbation at any point of the web changes the tension of every fibre in it.⁸¹ Context is everything. Which means we cannot simply account for organisms from the bottom up, but must do so *at least as much from the top down*. Not to mention from the sides, as in a web. We might be accustomed to thinking of biological processes in the abstract, isolated artificially by our mode of attention. But each element in each process is likely to be involved in several other ‘causative chains’, more like an unimaginably complex piece of choreography, where members of one group pass in and through another, for a while belonging to both or neither – each process having its own apparent end. According to Nobel Prize-winning geneticist Sydney Brenner, development ‘is not a neat, sequential process ... It’s everything going on at the same time.’ And, he continues, in words that strike at the core of the reductionist enterprise, ‘there is hardly a shorter way of giving a rule for what goes on than just describing what there is.’⁸²

This puts me in mind of some words of Marcelo Gleiser, here speaking of the whole material world: ‘When it comes to physical reality, there are no final explanations but ever more efficient descriptions.’⁸³ Not understanding – not even, necessarily, explanation; but description.

Until recently it was assumed that signalling pathways in cells were linear sequences, beginning from a defined starting point and progressing by an orderly sequence of steps to a defined conclusion. Somehow it was overlooked that each of these theoretically abstractable sequences was in practice interlocked at different points with other dynamically evolving sequences. A team of molecular biologists from Brussels decided to plot the interactions between just four cascades, each consisting of only five steps. The result, as they put it, is a ‘horror graph’ (see Plate 13[a]):

With four cascades of five steps, the number of possible positive and negative interactions is 760. This does not take into account the multiplicity of different isoforms of proteins at the different levels of the cascades, the multiplicity of effects of each intermediate in each cascade, the stimulation by a cascade of the secretion of

extracellular signals, or feedback or feedforward controls within cascades. In fact, so many interactions are now described (everything does everything to everything) that it is difficult to reconcile this concept with the known specificity of action of signals in each cell.⁸⁴

‘Everything does everything to everything’: interlocking, reciprocal and interpenetrating processes on such a scale show chains of causation to provide limited insight into cell responses.

But that’s not all. It’s not just that steps are related in a more complicated fashion than the machine model leads us to assume. It’s that the idea of there being *steps at all* (even if useful when focussing on the minuscule and the time-sliced) is misleading when looking at the whole over a duration of time. This is an idea that I mentioned in an earlier chapter, and will return to at various points in this book. It might not seem at first sight that significant. I hope to show that it is a crucial insight into what is peculiar about the way we in the West now tend to view the world. It is the difference between a sequence – a concatenation, a chain – and a single, indivisible movement, a flow. Flow is a process: a chain is a series of things, that are static until one is given a push or a pull by the thing next to it. An organism is a flow, and is alive. A machine is a chain, and is dead.

Can one even talk about causation in a flow? There are certainly temporal regularities, but does the earlier part of a stream *cause* the latter, in any conventional sense? For that, the two parts would have to be distinct entities. Alan Watts describes someone who has never seen a cat, squinting through a crack in a fence, and seeing a cat’s head appear, followed moments later by its tail. The cat turns round and comes back: first the head appears, then the tail. Later he sees another such event, and another. Eventually he draws the conclusion that the event ‘head’ causes the event ‘tail’, which is its invariable effect.⁸⁵ Causation could be seen as an artefact – a useful one – of time-slicing, slicing the flow. (It might be objected that, while it is true that no one part of a waterfall or a tornado causes another, it is surely possible to say that each, as a whole – the waterfall and the tornado – has a cause, or, at any rate, causes. But that depends on seeing the world at large as a collection of things, not processes. For where does the precipitation of rainwater, the configuration of the land, the air pressure, the wind speed that would be said to be their causes begin and end? I appreciate

that one argument might be that that is precisely why we need to think in terms of ‘things’; and it’s no doubt one reason why we do. But my claim is not that ‘thing-thinking’ has no uses – just that thinking in that way imports a whole set of assumptions that are, to say the least, open to challenge; and makes it difficult or impossible to see elements of the picture that we would be wrong to ignore.)

Similarly molecules, whether in an organic system or not, are ‘a part of a continuum of relational interactions’, more like a flow than a chain.⁸⁶ Beyond this, we have known since the 1960s that the behaviour of proteins cannot be fully described using linear, classical mechanics; and more recent research even demonstrates quantum entanglement between particles in two wholly distinct (as we would normally think) organisms, widely separated in space. Behaviour at the cellular level requires a quantum mechanical account in order to be understood, even if Newtonian mechanics is for most practical purposes an adequate, if approximate, fit.⁸⁷

Incidentally, this seems like a good moment to gloss the unfortunate expression ‘quantum mechanics’. After all, I am arguing that the machine model is misleading: what’s achieved by substituting one kind of mechanics – ‘quantum’ – for another – ‘Newtonian’? David Bohm puts it well:

The entire universe must, on a very accurate level, be regarded as a single indivisible unit in which separate parts appear as idealisations permissible only on a classical level of accuracy of description. This means that the view of the world being analogous to a huge machine, the predominant view from the sixteenth to nineteenth centuries, is now shown to be only approximately correct. The underlying structure of matter, however, is not mechanical ... This means that the term ‘quantum mechanics’ is very much of a misnomer. It should, perhaps, be called ‘quantum nonmechanics’.⁸⁸

Or, perhaps even, ‘non-quantum non-mechanics.’ I will discuss the model of quantum mechanics, and the related and even more powerful model, quantum field theory, in Chapter 24. It turns out that not only the word ‘mechanics’, but the word ‘quantum’, while certainly having a meaning, needs significant qualification.

Finally, unlike organisms, machines, including computers, do not operate in *Gestalt* fashion: when they are engineered so as to give the appearance of doing so – eg, facial recognition software – they do so still via rules and procedures applied to measurements, depending on trawling blindly and laboriously through vast heaps of data, in a process that speaks not of intelligence but its opposite. The linearity of this approach can no more reach the curve of true intelligence than straight lines, however many they be, can describe the circumference of a circle, though they may give the illusion of doing so. According to microbiologist Brian Ford,

the essential processes of cognition, response and decision-making inherent in living cells transcend conventional modelling, and ... reveal a level of cellular intelligence that is unrecognized by science and is not amenable to computer analysis ... biological systems are non-linear systems that are not amenable to digital modelling. As [the physicist Alex] Hankey has reminded us,⁸⁹ many are founded on unfathomable complexity. ⁹⁰

4. Not one-way action – maybe not even interaction?

A further problem with a machine model is that it suggests a direction of action of one thing on another. I have just suggested that it is usually myriads of ‘things’ having an action on myriads of other things. But even that is wrong. In organisms there is never just action without both *interaction* and *mutual construction*. Cause and effect in organisms, if it can safely be applied, is never unidirectional, but reciprocal. When an organism interacts with its environment, both parties change; each influences the other. And not in some minor, incidental fashion, either. When DNA is ‘active’ (as Lewontin points out, it is largely inert), most of the work is done by the cell environment. This, crucially, includes *the provision of information*, which is conventionally thought of as the role of DNA. Both cell and genome depend on their mutual interaction. As Schrödinger put it: ‘physical action always is *inter*-action, it always is mutual.’⁹¹

Research over the last 80 years or more demonstrates that it is not true that genetic change is simply due to accidents or damage to the DNA. Organisms actively reconstruct their genomes in response to their

conditions.⁹² Shapiro points out that the genome is actively shaped by the cell, as conditions change, over three distinct time-scales: first during cell reproduction, involving the formation of nucleoprotein complexes; then during multicellular development, involving epigenetic formatting; and ultimately in evolutionary change, involving changes in DNA sequence structure:

one of the main adaptive features of DNA-based heredity is that DNA is a highly malleable storage medium, permitting rapid and major changes to complex organisms without disrupting their functional integrity.⁹³

This has interesting consequences that may surprise some readers. C.H. Waddington found that heat-shocking pupae of the fruit fly *Drosophila* in some cases led to abnormal patterns of veining on the wings of the adult fly. If one continued to breed such cases together, heat-shocking the offspring, a point was soon reached where not only virtually all flies were abnormal, but their offspring continued to be abnormal *even without heat-shocking*. The number of generations necessary for the abnormal patterning to become fixed in the population was only 14 – too few for this to be supposed a coincident chance novel mutation. The gene expression had, it seems, been altered directly, and quickly, by the environment.⁹⁴

It is a standing joke among mechanists that cutting off the tail of a mouse does not produce tailless mice. However, scientists have developed microsurgery techniques that can alter the pattern of cilia on the surface of *Paramecium aurelia* (a unicellular organism). They found in a series of striking experiments that these changes were transmitted permanently to their offspring through the normal processes of cell division.⁹⁵ Similar phenomena have been demonstrated in other ciliates.⁹⁶

‘Today’s biologists’, writes the physicist Evelyn Fox Keller,

recognise that however crucial the role of DNA in development and evolution is, it does not do anything by itself. It does not make a trait; it doesn’t even include a ‘program’ for development. Rather, it is more accurate to think of a cell’s DNA as a standing resource on which a cell can draw for survival and reproduction ... it is always

and necessarily embedded in an immensely complex and entangled system of interacting resources that collectively are what give rise to the development of traits.⁹⁷

Let us just pause there for a second. DNA is ‘a standing resource on which the cell can draw for survival and reproduction’. Hardly surprising, of course – unless you had been led to believe, somewhat improbably, that organisms were ‘robot vehicles blindly programmed to preserve the selfish molecules known as genes’.

Another instance of reciprocal rather than unidirectional action, writes Dupré, is that of an enzyme, often described as working like a lock and key, ‘fitting just-so into whatever it’s acting on. Yet increasingly it looks as if the two actually accommodate one another, less a key in a lock than a negotiation on the fly.’⁹⁸ As one research group put it, ‘in reality, the activated receptor looks less like a machine and more like a ... probability cloud of an almost infinite number of possible states, each of which may differ in its biological activity.’⁹⁹

On another level, all multicellular organisms are involved in mutual, symbiotic relationships of various kinds with a host of microorganisms.¹⁰⁰ And the organisms, similarly, with the environment. Indeed, it is a good question whether the distinction between organism and environment can ever be other than approximate. In 1966, the experimental psychologist James Gibson coined the term ‘affordances’, referring to the opportunities afforded by an environment to an organism. The important point is that an affordance is not a thing, but resides in the relationship between an organism and its environment: the affordance requires both.¹⁰¹ What provides an affordance to one animal clearly may not to another, and may cease to be an affordance even for that animal at another moment in time. In this sense, affordances are emergent phenomena: they are opportunities for action that arise from a relationship and thereby define the organism as an agent.¹⁰²

Microbiologist Kriti Sharma, in her fascinating book, *Interdependence*, writes that ‘the cell is not exactly reacting to an environment, but is reacting *with* an environment, as oxygen reacts *with* iron and where *both are transformed*.’¹⁰³ Niche construction is often thought of as what Dawkins refers to as the ‘extended phenotype’ of the organism, a one-way process,

encoded in its genes and expressed through the animal creating external structures; yet, according to Dupré, this is to overlook that, equally, ‘the altered niche affects the behaviour and ultimately drives the evolution of the organism’. As he comments: ‘The difference in these perspectives nicely illustrates the difference between a thing- and a process-centred ontology.’¹⁰⁴ But we might go further: Sharma’s formulation of interdependence is not just one of interaction, but of *mutual constitution*. Organisms and environments do not

co-construct one another *sequentially*, as when an organism digests food from the environment and excretes wastes into the environment, which in turn change the organism’s metabolism, and so forth. Such a view still separates organism from environment and makes one the causal agent, and then the other, and so forth, so that agency shuttles between the two. The ‘reactivity’ view suggests that organism and environment are transformed *simultaneously*, and at each moment ... Rather, they arise *new* in each instant ... Moreover, this ‘arising anew’ occurs *dependently*— that is, phenomena bring each other newly into being in each instant.¹⁰⁵

The orthodoxy is that DNA affects the fate of the cell, the cell affects the organism, and the organism the environment. This is the bottom-up view. At least as true is the top-down view: that the environment affects the organism, the organism accordingly restructures the cell, and the cell makes appropriate use of DNA in doing so. In a letter to Moritz Wagner, Darwin wrote, on 13 October 1876: ‘In my opinion the greatest error which I have committed, has been not allowing sufficient weight to the direct action of the environment, i.e., food, climate, &c, *independently of natural selection* ... When I wrote the ‘Origin’, and for some years afterwards, I could find little good evidence of the direct action of the environment; now there is a large body of evidence’.¹⁰⁶ As Fred Nijhout, Professor of Biology at Duke, makes clear: ‘When a gene product is needed, a signal from its environment, not an emergent property of the gene itself, activates expression of that gene.’¹⁰⁷

Sharma asks for a radical shift in the way we conceive of living systems. She suggests that not one, but two, steps are needed:

The first is a shift from considering things in isolation to considering things in interaction. This is an important and nontrivial move; it is also a relatively popular and intuitive concept ... [But] to get to a thoroughgoing view of interdependence, I argue that a second shift is required: one from considering things in interaction to considering things as *mutually constituted*, that is, viewing things as existing at all only due to their dependence on other things. This second shift is potentially more subtle and difficult than the first, because though the first requires considering the mutual relations and influences *between* things, it does not actually require a change in the many habits and assumptions that usually commit us to viewing *things* as fundamentally independent.¹⁰⁸

One after another, causes that we conceived of as giving rise to an effect are shown to be at least to some extent, and in some cases to an even greater extent, themselves caused by the very effect to which they were supposed to give rise. We are used to thinking of metabolic processes as regulated by a cellular clock, though metabolic cycles can not only operate independently from such a clock, but themselves influence the circadian rhythms of that 'clock'.¹⁰⁹ In general, according to one researcher, 'it seems that connections between the circadian clock and most (if not all) physiological processes are bidirectional.'¹¹⁰ It also seems that while some gene mutations clearly do cause cancer, the majority of mutations found in cancer are the consequences, rather than the causes, of disruption of intercellular communication.¹¹¹ (The situation is made still more complex by the fact that, depending on context, the *same gene* can either promote or suppress the formation and growth of a tumour.)¹¹²

The activity of individual genes reflects the choreography of chromosomes, which reflects the larger choreography of the nucleus, which reflects the choreography of the cell and organism as a whole with the environment. Who, then, is sculpting whom? How can we know the dancer from the dance?

5. The 'parts' are themselves changing

A machine is made of parts that do not typically alter with their context. A tappet, a widget or a gasket continues its existence effectively unaltered wherever it is put. In an organism, unlike a machine, the ‘parts’ are continually engaged in changing themselves, sometimes radically, depending on context. One of the most obvious examples is that each cell has precisely the same DNA, yet that same DNA results in dramatically different kinds of cells arising, and hence different kinds of tissue, depending on context. While we assume a mutated gene to explain a malignant trait, write Sui Huang and colleagues,

nobody will doubt that normal cells as distinct as a stem cell, a mature neuron, a blood cell or an epithelial cell all share the very same genome. No mutations are invoked to explain the vastly different phenotypes and their inheritance within a lineage. This opens the first fundamental question: *how can the same set of genetic instructions produce a variety of discrete, persistent (non-genetically inherited) cell phenotypes?*¹¹³

The same ‘parts’ respond to quite different environments to produce utterly different effects.

An apparently ubiquitous phenomenon called ‘developmental system drift’ ensures flexibility in what a gene specifies.¹¹⁴ The result is that the same ends are repeatedly reached by quite distinct genetic means.¹¹⁵ In two species of roundworm, for example, ‘similar sexual structures arise from marked differences in signalling pathways, differences involving both novel wiring and novel protein modifications.’¹¹⁶ Different species of insects achieve segmentation using different mechanisms involving different genes, but with little overt difference in the outcomes.¹¹⁷ Detailed mechanisms can, of course, be identified for these developmental processes, but that’s not the point: ‘their details seem less important than the higher-level morphological “attractors” that exert a kind of downward causation ... on their permissible variation, which is rather prolific.’¹¹⁸ Whole outcomes may determine how ‘parts’ behave in order to reach them, at least as much as any of the ‘parts’ determines an outcome. Thus many paths involving ‘wide-ranging differences in the number, order, and kind of molecular events’ may lead to the same reliable outcome, and considerable variations

in genetic makeup can result in the expression of an identical phenotype, or form. Conversely, as we saw, identical genetic makeup does not necessarily result in identical outcomes in morphology; much depends on the context.¹¹⁹

I have already referred to another instance, that there are far more proteins coded for by DNA than there are genes to make them: what those genes make depends on the context and what is required in it. We saw that epigenetic ‘dials’ can create 2,000 or more variations of proteins from the same gene blueprint.¹²⁰ That the same genes can take on a number of roles provides a form of ‘belt and braces’ provision, ensuring that processes necessary to survival are preserved.¹²¹

Similarly, some genes are widely conserved across species. Pax6, the gene playing the critical role in the development of an eye, occurs in almost identical form in a range of species, enabling the development of a fly’s eye, a frog’s eye or your eye: yet the types of eye, how they are structured, and how they function, are very widely different (see Plate 13[b]).

And it’s by no means just genes that are so malleable in their function. What *any* molecule does changes according to what is required by the context, and at many levels throughout the organism. The enzyme phosphoglucose isomerase is ‘best known for its role in the process that releases energy inside cells, for example – but when outside the cell, it can perform at least four distinct functions, such as promoting nerve growth.’¹²² Similarly with neurotransmitters: for example, serotonin (5-hydroxytryptamine, or 5-HT for short), like other neurotransmitters, has remarkably diverse effects. It is widely known for its effects on mood, which partly explain the action of many antidepressants. But it also has many other uses: in cell division, blood clotting, bone metabolism, breast-milk production, liver regeneration, bowel function, appetite regulation, and sexual function – depending on the context.

Enzymes are notorious for their shape-shifting qualities, but proteins more generally are not the static structures they are popularly conceived to be, but continually cycle through different conformations.¹²³ Their structures and functions vary among cell types and change over the course of evolution. We now know that probably 30–50% of all proteins, the majority of which are not even enzymes, are so-called ‘intrinsically disordered’ proteins, lacking a fixed structure, and able to shift shape in a virtually unlimited field of possibilities (note the loaded language, which

speaks of the left hemisphere preference for stasis and fixity: not 'maximally flexible', but 'intrinsically disordered').¹²⁴

Since structure and function are inseparable, it is not just the molecule's function that changes, but its very structure. So it is with DNA. Genes are not things, not 'batons' to be handed on in the relay race of life. There is no such thing as Dawkins's ruthlessly selfish gene, determined to pass on its lineage unscathed, in the process dominating and exploiting that poor, blind robotic vehicle, the organism, to which it belongs. 'As genomes evolve, new genes are born and older genes may adopt novel functions, fuse, or disappear altogether,' writes systems biologist Adrian Verster.¹²⁵ Genes are malleable processes, subservient to the needs of the organism in which they happen for the time being to inhere.¹²⁶

This can be seen at two levels: changes in conformation, which affect gene expression of the same 'line of code'; and changes in the 'line of code' itself.

An example of the former is that something as simple as the degree of licking and grooming of her pups by a mother rat leads to changes in gene conformation, and therefore expression, in her offspring.¹²⁷ An example of the latter is the single-celled organism *Oxytrichia trifallax*, which gets rid of over 90% of its somatic genome, and re-organises the rest.¹²⁸ This is certainly an extreme case, but, according to philosopher of science Denis Walsh,

not an especially exotic one. The engineering of the genome by the organism is commonplace. Cells actively cut, transpose, copy and fix their genomes. They do so in highly sensitive, *adaptive* ways.¹²⁹

What that means is that *cells use DNA* to adapt to new ends; it is not a matter of *DNA using cells* to further its own 'selfish' ones. The idea that genes are somehow (how?) 'programmed' to pass on their DNA does not sit well with the fact that cells are constantly acting on it to change it or to repair it; and such persistence as there is depends on 'elaborate editing and correcting processes in the cell'.¹³⁰ These include anything from point mutations to large-scale genome rearrangements and whole genome duplications.¹³¹ There are 'massive levels of genomic rearrangement during development'.¹³²

It should not surprise us that the ‘parts’ of an organism change themselves, consume energy and turn over rapidly even though the whole structure persists, since life is *at every level* a dynamic process.¹³³ ‘Logically, the elements of a process can be only elementary processes, and not elementary particles or any other static units’, wrote biologist Paul Weiss.¹³⁴ One cannot explain a changing process by unchanging elements, though our extraordinary bias towards ‘thingness’, rather than forms or processes, encourages us to think that we could.

Sometimes biologists, says Dupré, talk as though they believe that organisms are put together

from bits of Lego ... Rather, living things are processes that are capable of assuming many protean forms: dynamic, ever-changing, but balancing, for a time, on just the right side of chaos.¹³⁵

‘Just the right side of chaos’: they are, in other words, what Naseem Nicholas Taleb calls ‘antifragile’ systems.¹³⁶ Taleb makes a distinction between robustness, which relies on resistance to change, but is susceptible to catastrophe when it finally can resist no more; and antifragility, which thrives on flexibility, makes small adjustments and thereby not only survives but *evolves*. All evolutionary processes are in this sense antifragile, constantly adapting, and because of their ability to permit constant small ‘errors’ (as they seem at the time) able to preserve themselves against final destruction. The expression ‘the right side of chaos’ reminds us that a system that is capable of flexible and rapid response to a multitude of possible occurrences must have inbuilt *instability*, as well as stability: the classic case of this is the Eurofighter Typhoon jet, a supremely agile fighter plane, which was built deliberately unstable so as to make it highly responsive. Because of this it can make swift and abrupt changes in direction that a more stable plane could accomplish only over many miles.

An organism must be capable of a vast repertoire of available responses, and some of them, unbelievably enough, are invented by organisms ‘on the hoof’, as we shall shortly see. Stuart Kaufmann writes that

genomic systems lie in the ordered regime near the phase transition to chaos. Were such systems deeply into the frozen ordered regime,

they would be too rigid to coordinate the complex sequence of genetic activities necessary for development. Were they too far into the gaseous chaotic regime, they would not be orderly enough. Networks in the regime near the edge of chaos – this compromise between order and surprise – appear best able to coordinate complex activities and best able to evolve as well.¹³⁷

Ultimately, even what we conceive to be the ‘solid’ parts of cells are actually flows. The living cell is mainly fluid, principally water. Even surfaces, cell membranes, the cytoskeleton, and the various fibre systems, that look relatively solid, are ‘subject to more or less continuous dissolution and reconstitution.’¹³⁸ We imagine the organism contains fixed structures because of the nature of left hemispheric attention, which replaces flow with frozen slices removed from time: our static diagrams, or photomicrographs.

6. The influence of the whole

While a machine has clearly defined parts, this is not, then, the case in an organism.¹³⁹ A process arguably has no parts and is, in reality, an indivisible unity. As Scott Turner puts it, ‘integrity and seamlessness seem to be the essence of an organism’.¹⁴⁰ To the extent that one can speak of an organism as having ‘parts’ at all, we find them by dismantling the whole in an inevitably somewhat arbitrary fashion. They are ultimately a product of human attention, a function of the way we choose to attend to the organism for a particular end of our own, and the parts we choose to define change depending on our focus of interest at the time.

Let us assume, however, for the sake of argument, that there are identifiable parts. These parts are unlike machine parts – and not just because they constantly change. For such parts do not, as those of a machine do, exist prior to the whole that they make up, but come about *at the same time* as the making of the whole. They are further examples of ‘mutual constitution’. They are not pre-existing entities put together, but instead distinguish themselves in the process of self-differentiation of a living whole: thus the liver, the heart, the kidneys are not assembled, but come into ever more defined being as the whole living organism grows.

And the relationships between the parts don't go to *make up* the whole, but *derive from* the existence of the whole. They are handy *post factum* mental representations. 'Parts' are inextricably involved with their context, without which they are both impotent and unpredictable; and neither the parts, nor even the local interactions of the parts on their own, account for the qualities of the whole organism that we observe.¹⁴¹

Lower levels of an organism are not straightforwardly explanatory of the higher levels. Microscopic findings do not predict macroscopic outcomes, nor vice versa. Walsh writes that 'as physical systems take on new configurations, they bring new phenomena into existence'.¹⁴² These phenomena are not easily accounted for in terms of phenomena at some more reduced level. Examples given by him include atomic nuclei, magnets, superconductors, excitable media, fluids and tissues, and organic agents.¹⁴³ As always, we are dealing with *Gestalten*, not with constructions.

In explaining a multicellular organism's stability, the intrinsic properties of what we see as the parts are of little significance compared with 'the dynamic relationships among parts at different levels of the organisational hierarchy.'¹⁴⁴ Note, dynamic relationships among parts *at different levels*. The existence of emergent properties at every level throughout the natural world suggests, too, that we are on the wrong track when we try to account for what we find in terms of things rather than processes. It would be like trying to account for the unique quality, the power and, yes, the *life* of a piece of music by examining each note, or at most a phrase, in ever greater detail, outside the flow of the whole work, in the hope that by this 'drilling down', as we say, there at last we will find the secret. We cannot account for a phenomenon at the topmost level merely by a concatenation of elements at the lowest level. We are dealing with a *Gestalt*. That is to say the 'betweenness' is more important than the 'things' we believe we discern within it. Relationships are prior to *relata*, a topic I will return to in Part III.

An aside on terminology. When I use the word 'betweenness', I refer, not just to what happens between two or more 'things', but to the unique whole in which we might later come to identify 'things' and the relationship between them. Thus an electrical current resides not in the negative pole or the positive pole, nor the space between the poles, but in the sum of all of these, *plus*, crucially, the wholly new element that comes about from 'adding them together' (which, of course, never happens except in our theoretical *post factum* reconstruction). There is no hitherto existing

adequate word for this idea in English, but the concept is important, so ‘betweenness’ will have to do. It is close to Sharma’s ‘interdependent mutual constitution’.

Molecular structures are good examples of entities that cannot be reduced to their parts: according to biochemist Ross Stein, ‘the essential nature of the compound subject transcends, and cannot be reduced to, the simples from which it is composed ... Complex objects are no mere aggregates, but possess a defining unity.’¹⁴⁵ And at the phenomenological level we see this all the time. As molecules form new wholes, utterly new qualities, unpredictable from the apparent constituent parts, emerge: so a tasty white crystalline substance – table salt – emerges from the compound of sodium, a dullish grey, malleable metal, and chlorine, an evil-smelling, poisonous, greenish-yellow gas.

Writing about the ways in which living systems display characteristics not to be found in their constituent parts, cell biologists Sophie Dumont and Manu Prakash observe that:

subtle variations in parameters (energy expenditure, architecture, and temporal dynamics) can dramatically change the mechanics of the resulting structure in ways we do not understand ... Emergent structures exhibit properties that their smaller building blocks (air molecules or sand grains) do not ... It is very likely the case that these mechanical design principles will be fundamentally new and as such may not have a known analogue in nonliving physical systems.¹⁴⁶

The expected conventional terminology of mechanics here seems awkward, and with good reason. For, if ‘mechanics’ are dramatically changed in ways we do not understand – and I have no doubt that they are – in what sense are they still mechanics? If the ‘mechanical design principles’ are ‘fundamentally new’, and have no ‘known analogue in non-living physical systems’, surely the comparison of organisms with machines (still implicit in the language with which, I quite understand, the researchers must write their paper if they wish to get it published) is self-confuting.

‘The astonishing plasticity of organisms contrasts with the brittleness of machines’, writes Nicholson,

which tend to stop working when their parts break or are damaged. Of course, redundancy and self-repair can be built into the design of machines to some extent, and although this can make their operation more robust and more reliable, the inherent limitations of their fixed architecture remain.¹⁴⁷

Here the question arises, how the part can have that sense of the whole to which it belongs, of which Barbara McClintock spoke. A machine as a whole typically does not adapt in response to parts becoming worn or defective, nor invent a solution at a local level that will further the purpose of the overall machine.

Carl Woese again:

Machines are stable and accurate because they are designed and built to be so. The stability of an organism lies in resilience, the homeostatic capacity to re-establish itself. While a machine is a mere collection of parts, some sort of ‘sense of the whole’ inheres in the organism, a quality that becomes particularly apparent in phenomena such as regeneration in amphibians and certain invertebrates and in the homeorhesis [see note] exhibited by developing embryos.¹⁴⁸

To quote Ford, ‘Although we now recognise that experiential input can bring about epigenetic modification of the cell nucleus, there must be undivined mechanisms that relate the experiences of the entire multicellular organism back to the cell.’¹⁴⁹ And even the single cell seems to have what the biochemist Jesper Hoffmeyer describes as ‘tacit knowledge’ that is ‘inherent within the cellular organization and must be presupposed by, rather than materially built into, the DNA description.’¹⁵⁰ Hence Shapiro’s claim that ‘life requires cognition at all levels’.

As yet, we have little idea of how the ‘parts’ seem to ‘know’ what whole they belong to, and how it should be shaped: it is an ancient question, to which no-one has ever given a satisfactory answer. One answer worth considering is that the part quite simply does not exist: the being can *only* be considered as a whole. As John Haldane noted:

From a consideration of the general characteristics which distinguish a living organism from a machine I had become convinced that a living organism cannot be correctly studied piece by piece separately as the parts of a machine can be studied, the working of the whole machine being deduced synthetically from the separate study of each of the parts. A living organism is constantly showing itself to be a self-maintaining whole, and each part must therefore always be *behaving as a part of such a self-maintaining whole*.¹⁵¹

The question, by the way, is not ‘by what immediate mechanism?’ – to be answered at the molecular level by speaking of, say, electrical gradients affecting the direction of diffusion of polarised molecules; an account which is at best a first step towards a description, hardly itself an explanation, let alone an understanding.¹⁵² That is like trying to understand a ballet by measuring the impact of ATP hydrolysis on myosin in the dancer’s skeletal muscle fibres. In the words of Ford,

Knowing how the intricate mechanisms within the cell perform tells us nothing of the entire cell, just as studying the hormone fluctuations and changes of blood pressure in a human subject would reveal little of why they were late for work in the first place ... It is as though we have clamoured for the most intimate insights into the minutest workings of the telephone exchange, while disregarding the subscribers – who they are, why they choose to speak, or what they are saying.¹⁵³

When they are injured, organisms – from simple bacteria, to trees, to complex vertebrates – are often able to heal themselves and repair the damage, regaining the form that was lost. Some organisms (eg, axolotls and salamanders) can regenerate entire body parts, including limbs, parts of the brain, and even the heart. Lobsters can regrow claws, spiders can regrow legs, and rabbits and certain species of mice can regenerate a number of their organs.¹⁵⁴ Although antler growth is peculiarly shielded from environmental influences, and although no two sets of antlers are the same, any one animal’s antlers are perfect mirror images of one another, and, if

both are cut off, will regain the same shape from memory.¹⁵⁵ Trees and plants, of course, have a multitude of individual and characteristic forms of their own, which are not principally moulded by the environment, and which they will strive to regain if their form is damaged (see Plates 13[c] & 13[d]).

Indeed, some relatively complex creatures, such as flatworms, can regenerate the entire body including their centralised brain, from a fragment of the original animal.¹⁵⁶ This was noted by Charles Darwin's grandfather Erasmus Darwin.¹⁵⁷ In one case a planarian, a type of flatworm, was cut into 279 pieces, each of which proved capable of generating a new body within a few weeks.¹⁵⁸ Each part appears to know what it lacks, and can thus regenerate a new whole. What is still more extraordinary is that if flatworms – the 'first' class of organism to have a centralised brain with true synaptic transmission,¹⁵⁹ and to share the majority of neurotransmitters that occur in vertebrate brains¹⁶⁰ – are decapitated, they not only regrow a head, but retain their memories; for example, which way to turn in a maze they had previously 'solved' before their heads were chopped off.¹⁶¹ A body is a moulded river indeed.

The preservation of form does not depend on trotting out 'pre-programmed' developmental blueprints.¹⁶² For example, the face of a tadpole is quite different from that of a frog; in order to produce the typical adult frog's face, a series of deformations must be carried out, and, along with it, various organs and tissues relocated. Surely, then, it follows the steps of a programme? Not in any obvious sense of the word. When developmental defects were artificially induced in a tadpole, subsequent development was able to adjust accordingly, apparently making corrections towards what it seemed to sense was its ultimate goal, the adult frog's face, despite there being no 'programme' or previously known mechanism to direct it.¹⁶³ Michael Levin, a prominent geneticist at Tufts, writes:

Most organs were still placed into the right final positions, using movements quite unlike the normal events of metamorphosis, showing that what is encoded is not a hardwired set of tissue movements but rather a flexible, dynamic program that is able to recognize deviations, perform appropriate actions to minimize those deviations, and stop rearranging at the right time.¹⁶⁴

The question is ‘where is the information?’ That is to say, the in-*form*-ation. Where is the overall *form* or shape of the being stored, as a whole, in service of which any mechanisms we can detect and measure would be acting?

We should remember that evolution, and indeed the reproduction of organisms, is not a flow of ‘information’ only in the abstract sense of that word – that of, eg, ‘information technology’. We should remember that information is not a *thing*: it is the capacity for a channel to create a new link between two processes. Evolution is a physical, embodied process, not reducible to pieces of data. Organisms flow down the ages by reproduction and by evolution, literally mingling bodies – their forms – at a moment in time and from generation to generation, something no machine does: every embodied reproduction is evolution in action, and every evolutionary advance is an embodied reproduction. Offspring of organisms, from single cell to *homo sapiens*, are not separately engineered from new material externally, but emerge as new whole forms from the material forms of the bodies of their parents. The flow is embodied and seamless.

Barbara McClintock discovered, in experiments conducted in the 1940s, and therefore before the structure of DNA had been determined, that the genome is not a static entity, but subject to rearrangement, and moreover that there were heritable changes in gene expression not caused by changes to DNA sequences: what we now call epigenetics. She reflected that a genome must repeatedly face ‘shocks’ of various kinds, for some of which it is prepared and to which it can respond in a ‘pre-programmed manner’. As she says, some sensing mechanism must be present in these instances to alert the cell to imminent danger, and to set in motion the orderly sequence of events that will mitigate this danger. That is in itself remarkable. But she saw something still more remarkable:

there are also responses of genomes to unanticipated challenges that are not so precisely programmed. The genome is unprepared for these shocks. Nevertheless, they are sensed, and the genome responds in a discernible but initially unforeseen manner ... in most known instances of such challenges the types of response are not predictable in advance of initial observations of them. ¹⁶⁵

These responses appear to be, as C.H. Waddington believed they were, due to information in the organism as a whole, not just localised to specific pre-existing, temporarily silenced, genetic mutations.¹⁶⁶ To quote Noble, ‘organisms seem to be very resourceful when challenged with knockouts, blockers or absence of nutrients. If we look for that ingenuity at the molecular level we may not find it.’ On McClintock’s discoveries, he comments:

She could not have anticipated the extent to which her idea would be confirmed by the sequencing of whole genomes ... [implying] the movement of whole functional domains. This is far from the idea of slow progressive accumulation of point mutations ... the rearrangement of whole domains including the functionality of those domains in response to stress could have been the origin of creativity in the evolutionary process ... This is why McClintock characterised the genome as a *highly sensitive organ of the cell*.¹⁶⁷

From all of this it would seem that an organism is not just driven from the bottom up. Decisions seem to be taken by the organism – even a single cell – as a whole; what’s more, intelligent decisions – ones that are creative and ‘hand-tailored’, not just selected from a predetermined repertoire – which in itself would require a (lower) level of intelligence. Considering a number of accounts of intelligence, Ford writes that common to the ‘different definitions of intelligence there is one concept on which all seem to focus: the ability to deal constructively with the unforeseen’:

The definitive demonstration of intelligence, must observe the cell encountering a situation which it cannot have previously experienced; it needs to demonstrate abnormal behaviour specifically in response; and the cell must act remedially to restore normality to its abnormal predicament.¹⁶⁸

Cells pass each of these tests with flying colours. And they do so, often, in an awe-inspiring balance between autonomy and co-operation that a human society might envy.

Everywhere we can observe this proclivity for ingenuity. When a surgical suture is secured with staples, the resulting repair is conspicuous and crude. Within weeks, the scar is healed, smooth, and scarcely visible. The cells at the site of the incision have identified the nature of the surgical trauma and have initiated manoeuvres to restore it. Capillaries re-form so that the microcirculation is restored, innervation is reinstated, and the many epidermal layers are properly reconstituted. None of this we understand. These complex processes are invisible to the brain, and are not controlled by cerebral activity, neither are they subject to regulatory intervention by circulating hormones. The cells are the decision-makers ... No computer model comes close to emulating the mechanisms manifested by an amoeba, as it seeks its way ahead, selects which food substances are suitable for ingestion, modifies its cell membrane to accommodate the situation and moves on in a direction it has motivationally selected. A team based at Sapporo, Japan, have even shown that amoebae have memory for events.¹⁶⁹ This takes us deeper into the realities of living cells than current conceptions of memory as the propensity only of cell aggregates. Single cells can take decisions; single cells can plan responses; single cells contain memory.¹⁷⁰

I will have more to say about all this in Chapter 25.

Another interesting example relates to the nervous system of animals, and concerns the well-known principle that ‘what fires together wires together’. Such plasticity (known as Hebbian, after Donald Hebb, the Canadian psychologist, who posited it) is widely considered to be the mechanism by which information can be coded and retained in neurones in the brain. ‘The general idea is an old one’, wrote Hebb, ‘that any two cells or systems of cells that are repeatedly active at the same time will tend to become “associated”, so that activity in one facilitates activity in the other.’¹⁷¹ With continued use, changes at the synaptic cleft mean that such neuronal sequences are preferred, and may even become semi-automatic, in a process known as kindling. This is well established, and is a process of positive feedback: more leads to more. So far, so good. Recently, however, we have become aware that Hebbian adaptations are just one of three possible changes that may occur with use. A second is the opposite. It is

homoeostatic: in other words, up-regulation causes a compensatory down-regulation – negative feedback: more leads to less. But even more interestingly, we now know there is a process called neurotransmitter switching, whereby the neurotransmitter involved at the synapse is swapped for another:

Significantly, transmitter switching often reverses the sign of the synapse: an excitatory transmitter is replaced by an inhibitory one or vice versa. These reversals in synaptic sign change the function of the circuits in which they occur, complicating the interpretation of the connectome ... ‘Neurons that fire together, wire together’ encapsulates Hebbian plasticity. ‘Neurons with chronic firing, reverse wiring’ summarizes the impact of transmitter switching.¹⁷²

‘Complicating the interpretation of the connectome’ looks like an understatement. Not for the first time we are brought to ask, what is causality? Certainly we cannot just close our eyes to what we are seeing and hold to conventional bottom-up (ie, from parts to whole) causation only, as the machine model suggests. (A bottom-up approach starts, in any case, only from what is *presumed* to be ‘the bottom’.) In organisms the whole is also necessary for the functioning of the parts: the part is apparently able to access information about the whole, and act on it in service of the whole. We may not know how, but that is not grounds for denying that it happens. One solution might be to accept that there are no parts as such, and that what we see is simply the action of a whole, as a whole: the problem lies in our perception.

If a cell is placed in a slightly acid medium, its mitochondria break up into small spherical beads. But, amazingly, on return of the cell to a normal medium, they merge again into strings, and eventually take on once more the appearance and internal structure of normal mitochondria.¹⁷³ Further, let us suppose you cut a developing limb bud out of an amphibian embryo, shake the cells loose from each other, and then allow them to aggregate once more into a random lump. You then replace the random lump in the embryo. What happens? A normal leg develops. The form of the limb as a whole dictates, according to Lewontin, the rearrangement of the cells:

Unlike a machine whose totality is created by the juxtaposition of bits and pieces with different functions and properties, the bits and pieces of a developing organism seem to come into existence as a consequence of their spatial position at critical moments in the embryo's development. Such an object is less like a machine than it is like a language whose elements ... take unique meaning from their context.¹⁷⁴

Or like a dynamic *field*. 'If the organism was simply its substance we would not be able to recognise it from one day to another', wrote Lawrence Edwards, an expert in plant morphology. 'Yet its being and largely its form are invariant from one moment to another, and from one day to another. The *form* can live within the flux. Something greater than the substance takes it up, moulds it, uses it, and then casts it away.'¹⁷⁵

Again, unlike in a machine, no two limb buds in a developing embryo are ever exactly the same; the buds of formative, mesenchymal cells develop each in their own way. The result is in each case a normal, fully formed limb of the kind dictated by its position. But not just its 'predestined' position: the same cell group in a limb bud can *nonetheless*, though destined to form the pattern of, say, a right limb, give rise to the mirror image, a left limb, with the opposite symmetry, simply by being transplanted to the opposite side of the embryo.¹⁷⁶

Another example of the whole somehow overruling the parts comes from fascinating experiments on the fruit fly, *Drosophila*. The absence of a gene, homologous to Pax6 (see above), causes the fly to develop without eyes. However, if such flies are interbred, they have been found soon to develop eyes – despite not having the gene in question.¹⁷⁷ Indeed, after 'knocking out' (disabling) both copies of a gene that had a normally important role in the development of a mouse, molecular biologists found that in many cases the mouse seemed unimpaired, and functioned normally.¹⁷⁸ In certain strains of mice, mutations in the *Kit* gene cause white patches on the tail and feet; if a mouse has one normal *Kit* gene and one mutated one, it will have the patches. Yet some of the offspring of such mice, who inherit two normal *Kit* genes, still have the white tail.¹⁷⁹ Resistance to viral infection in a nematode worm was achieved by some of the population having DNA that produced a viral-silencing RNA sequence;

when cross-bred with worms who lacked this DNA, some of the offspring inherited the antiviral mechanism and some didn't. All as one might expect. However, subsequent generations inherited the antiviral mechanism even if they lacked the required DNA. This non-DNA inheritance was followed successfully for 100 generations.¹⁸⁰ Similarly 'adaptive mutation' dictates that if a strain of bacteria is unable to utilise lactose, and is placed in a lactose-rich medium, 20% of its cells will quickly mutate into a form that enables them to process lactose: the mutation is then inherited by subsequent generations.¹⁸¹

Organisms don't just passively wait, then, for a lucky accident or resign themselves to dying out, but actively remodel themselves in response to changes in their environment.

As mentioned, changes in DNA are no longer thought to be mere accidents.¹⁸² Indeed Darwin himself wrote:

I have hitherto sometimes spoken as if the variations ... were due to chance. This, of course is a wholly incorrect expression ... Some authors believe it to be as much the function of the reproductive system to produce individual differences, or slight deviations of structure, as to make the child like its parents.¹⁸³

Another idea that perhaps does not square too well with the idea of genes bent on preserving themselves at all costs.

Everything depends on an organism's capacity to be flexible and responsive to its environment, just as the environment, both living and non-living, is responsive to organisms. It is this combination of interlocking responses that ensures stability. 'There is now good experimental evidence', write Jablonka and Lamb, 'as well as theoretical reasons, for thinking that the generation of mutations and other types of genetic variation is not a totally unregulated process.'¹⁸⁴ A seminal paper asserts that 'not all genome changes occur at random and that cells possess specific mechanisms to *optimize their genome* in response to the environment'¹⁸⁵ – not even the gene actively optimising the cell, but the cell actively optimising its genes. In a now famous paper in *Nature* it was claimed that 'cells may have ways of choosing which mutations occur', and they can 'learn from experience'.¹⁸⁶ Another has shown that 'bacteria that have lost their flagella

through deletion of the relevant DNA sequence can evolve the regulatory networks required to restore flagella and so restore motility in response to a stressful environment within just four days'.¹⁸⁷

In Shapiro's phrase, cells and organisms have evolved to become, 'cognitive (sentient) entities that act and interact purposefully to ensure survival, growth and proliferation'.¹⁸⁸ Evolution itself is an 'intelligent' process (he describes it as not only 'cognitive' and 'sentient', but 'thoughtful'). According to him, a twenty-first-century view of evolution implies

a shift from thinking about gradual selection of localized random changes to sudden genome structuring by sensory network-influenced cell systems ... It replaces the 'invisible hands' of geological time and natural selection with cognitive networks and cellular functions of self-modification. The emphasis is systemic rather than atomistic, and information-based rather than stochastic [random].¹⁸⁹

This is not only plausible, but no form of 'heresy'. According to Denis Noble, Darwin 'was concerned that he did not know the origin of variation and he acknowledged the existence of other mechanisms, including the inheritance of acquired characteristics.'¹⁹⁰ In *The Origin of Species*, he had written:

I placed in a most conspicuous position – namely, at the close of the Introduction – the following words: 'I am convinced that natural selection has been the main but not the exclusive means of modification.' This has been of no avail. Great is the power of steady misrepresentation; but the history of science shows that fortunately this power does not long endure.¹⁹¹

On the last point, however, he was sadly mistaken.

Cell biologist Bruce Lipton writes of the immune system, producing antibodies, that it

employs an amazing mechanism called *affinity maturation*, that enables the cell to perfectly adjust the final shape of its antibody protein. Activated immune cells make hundreds of copies of the original antibody gene. However, each new version of the gene is slightly mutated so that it will encode a slightly different shaped antibody protein. The cell selects the variant gene that makes the best fitting antibody.¹⁹²

This is further sculpted (by a mechanism known as somatic hypermutation) to become the perfect physical complement of the virus that it is to neutralise. What's more, the cell remembers this antibody shape and passes on the memory to its daughter cells.

In the late nineteenth century, Hans Driesch separated the two cells produced by the first division of a fertilised sea urchin egg and observed that each of these, which would normally have produced half of an organism, actually produced a complete *Pluteus* larva, the initial free-living form of the species. Each of these larvae was half the size of the normal *Pluteus*, but was complete in every detail and grew into perfectly normal adults.¹⁹³ 'How', asks Brian Goodwin, 'is the system organised so that when these two cells remain part of one embryo each produces half the future organism, but when they are separated, each produces a whole?'¹⁹⁴ Interestingly, Driesch compared the phenomenon with the bar magnet, which if divided produces two magnets, each with two poles.

One way of looking at multicellular organisms, including, of course, ourselves, is that we are historically an aggregate of single cell organisms that gave up their autonomy and co-operated, so as better to survive: we are ancient societies. Signals released by cells into the environment allowed for the co-ordination of a dispersed population of unicellular organisms. This enhanced the survival of single cells by providing them with the opportunity to live as a primitive 'community'.¹⁹⁵ Even the individual cell is itself the result of collaboration of many parts, including elements such as mitochondria which were originally bacteria that took up residence in the intracellular environment. The trillions of cells that go to compose our bodies, like the millions of people who live in a large city, share common purposes served by the adoption of widely different roles. And so do the trillions of commensal organisms – bacteria, mainly, on which our bodies

depend for healthy functioning. Until recently, bacteria were largely viewed as opportunistic inhabitants of the comfortable environment offered by the gut, but they are now known not just to be vital for digestion, but for the nervous system, the immune system and even for normal development at all.¹⁹⁶ They belong to the wider conception of ourselves as organisms: ‘commensal’ means sitting at a shared table: we couldn’t dine without their company. What counts as an individual – not just a part – depends on the question being asked, and the focus of our interest.

As has often been pointed out, bees, ants and termites behave like parts of a whole so tightly organised that they seem to act as if parts of one large organism. ‘A single termite is unintelligible’, writes Brian Henning,

apart from the collective organism of which it is a member ... as a single superorganism, the termite colony is extended in space and time, without clearly defined boundaries or a skin to define where the environment stops and the superorganism begins ... a single termite is no more an individual than a single cell in a petri dish solution.’¹⁹⁷

7. Imprecise boundaries

That leads to the next issue. A machine has clear boundaries; a natural system does not. The machine model involves being able to identify viably distinct, stable things as parts, and a viably distinct, stable thing – the machine – as the product of their combination. Processes, by contrast, can overlap in a way that ‘things’ typically do not. Processes ‘have boundaries that are fuzzy or indeterminate’, write Dupré and Nicholson:

Processes are individuated not so much by where they are as by what they do ... At no level in the biological hierarchy do we find entities with hard boundaries and a fixed repertoire of properties. Instead, both organisms and their parts are exquisitely regulated conglomerates of nested streams of matter and energy.¹⁹⁸

They liken organisms to Jupiter's Red Spot, which, 'by means of its continuous activity ... demarcates itself from the flux of its surroundings'.¹⁹⁹ Organisms are not tightly defined entities: neither even, as we saw, are some kinds of genes.²⁰⁰ The genome itself is not as defined as we imagine: 'it is not even clear that there is any unique entity that qualifies as the genome of an organism.'²⁰¹

Whitehead pointed out the artificiality of drawing boundaries to organisms:

The truth is that the brain is continuous with the body, and the body is continuous with the rest of the natural world. Human experience is an act of self-origination including the whole of nature, limited to the *perspective* of a focal region.²⁰²

We have seen that the environment is, in a concrete fashion, partially constituted by, and constitutive of, interdependent organisms, in which each is involved in the evolution of the other. 'Some of these interactions', according to Dupré, 'are so intimate and so fundamental to the survival of the organism that it has been hotly debated whether the interacting entities are distinct at all, or should rather be understood as constituting a single life.'²⁰³ The philosopher of science Argyris Arnellos writes that 'collaboration is one of the main characteristics of life and its evolution ... it is very hard to imagine life (both at the intra- and the inter-cellular level) that is not collaborative.'²⁰⁴

What he means by this can be illuminated by biochemist and philosopher Stephan Guttinger, who writes that 'symbiotic life forms are the rule rather than the exception in the biological realm':²⁰⁵

the significance of symbiosis examples in general is the realisation that the entities we used to refer to as single living things ... turn out to be less autonomous than we might have thought them to be ... it is not just the termite that shapes the mound and that has the power to digest, reproduce and survive, but a *system* of interconnected entities that has to be treated as the centre and/or origin of these capacities or powers.²⁰⁶

Too narrow a focus means that we conventionally think of organisms as sharply delineated individual entities, with linear causative relations. If, instead, we conceived them as systems, in which causation is both distributed and reciprocal, and these systems themselves nested in other, larger systems, and so on upwards and outwards, we would see a quite different picture unfold. We would then see, not just competition – that we would still, of course, see – but a combination of competition with *co-operation*. Such a relationship, in which division and union are fruitfully balanced, is what we mean by collaboration.

A superannuated myth of pop science has it that human beings evolved to be fundamentally selfish, striving to maximise their inclusive fitness by aggression and nepotism. As the anthropologist Christopher Hallpike reminds us, ‘studies of actual human behaviour, especially that of children show that, whatever evolutionary theory may say, while we must obviously act for our own preservation and well-being, we also have highly developed capacities for sympathy, co-operation, and group loyalty’.²⁰⁷

Ultimately we have common ancestors. As I suggested, evolution becomes problematic when species are thought of as one sharply defined thing replacing another. However, ‘this is no problem at all for a process. No-one expects a thunderstorm or a battle to have precisely delineated boundaries.’²⁰⁸ Living organisms integrate their cellular communities by mingling their bodies and sharing their genes. In this way they can acquire learnt experiences from other organisms.²⁰⁹ The boundaries of species are, in reality, blurred. In the words of Daniel Drell, Programme Manager of the US Government’s Joint Genome Institute: ‘We can no longer comfortably say what is a species any more’.²¹⁰

8. Boot-strapping

In the case of a machine, the instructions for making the machine cannot themselves be the product of the very machine they are designed to make. Even in a computer, the software is separate from the hardware: the hardware has to be finished, before the software can be extrinsically inserted into it. The code for making the machine is not being *simultaneously* written by the machine *in the very process of beginning to form itself as a computer*. By contrast, as philosophers of science Paul

Griffiths and Karola Stotz put it, with reference to the work of Susan Oyama,

the developmental information expressed in the organism is not present in the starting point of development, but is itself created by the process of development, through feedback from the current state of the organism to the states of the resources that will influence future development.^{[211](#)}

Even if computers can be brought to a point where they make apparently autonomous decisions, they can do so only because the capacity for them to do so depends on previous acts of human intelligence and human will. The ‘parts’ of an organism that are claimed to account for emerging phenomena lack adequate explanatory power, since the way in which those parts act when and where they do, and even their continued existence, cannot be understood without invoking the process they are supposed to explain, and, in something of an infinite regress, the processes to which, in turn, that process leads. A machine’s functioning is linear, whereas the process of living things is of entities that mutually co-arise.

WHY HAS THE MACHINE MODEL PROVED SO ATTRACTIVE?

In the face of such overwhelming evidence of the inadequacy of the machine model to the study of living organisms, why, then, does this product of the mid-Victorian mindset persist?

One reason is its simplicity. We are familiar with machines, and because they are what we are used to making, taking apart and putting together, it is perhaps a natural assumption that other systems, ones that we didn't make, will work in a similar way. This is particularly the source of the appeal in *molecular* biology, a discipline that necessarily concerns itself primarily with events that appear highly circumscribed in both space and time. Here chains of cause and effect tend to be abstracted from their wider context, and therefore seem to function in a broadly mechanical fashion. Molecular biology places 'the entire explanatory burden on a relatively stable, epistemically tractable entity: a one-dimensional digital code that can be replicated, modified, and transplanted from one individual to another'.²¹²

Regular and reliable patterns of behaviour discoverable in an organism are unreflectively assumed to demonstrate mechanisms. But regularities do not always mean there is a mechanism; nor do they imply determinism. Random events can cause predictable outcomes. The rain that falls at a random moment in time in a random distribution on a landscape encounters potential stored in the landscape; that potential is actualised in the predictable flow of water down to a river mouth into the sea. Similarly, accidental deaths are by definition unplanned. Yet roughly the same number of accidental deaths, around 17,000, occurs in the UK every year. There is not an emergency team of bungee jumpers on standby to make sure the statistics remain steady. It cannot be overemphasised that regularities in nature do not imply mechanisms, nor do they imply determinism.

Christopher Hallpike makes the point that convergent patterns of social evolution do not imply determinism. 'It is rather like the game of Monopoly', he writes:

the players are all different and the throws of the dice produce a completely different game each time, yet the underlying constraints

produce essentially the same result – a single player who owns everything and has driven all the others into bankruptcy. This is a good illustration that unique events, even randomness, and free will, are quite compatible with broadly predictable outcomes.²¹³

This is true without reference to the quantum nature of reality. But when one takes that into account, the case is strengthened. ‘Quantum physics showed that even the causal mode of description is only one very special way of tying together natural phenomena, and thus lawfulness in nature is not equivalent to mechanical causality’, wrote Bohr’s assistant Aage Petersen. ‘We have had to learn that the causal mode of description is a limiting case that encompasses only the simplest features of nature.’²¹⁴ Physicist David Oliver puts it like this:

Nature is neither inevitably random nor completely lawful and predictable ... Think of the universe as fabric woven on a loom. The warp threads are the laws of motion – rigid, and invariant, the weft, the emergent random strands that weave within the ordered warp. Together order and randomness form a creative whole ... There exist physical events the randomness of which cannot be dispelled by the most determined efforts to expose ‘a deterministic cause’ ... a stream of unpredictable information constantly enters the stream of definite information, a source of novelty, creativity, vitality...²¹⁵

Living things superficially exhibit some of the reliability and stability we associate with clockwork, though nothing about them in any way resembles clockwork, and they are, by many orders of magnitude, both much *less* stable, and at the same time much *more* reliable, than any machine.

I imagine some readers are thinking that, for all it may be a fiction, the machine model has persisted precisely because it has proved a very useful one. That is true enough. But that it can often prove useful does not mean it is true. In daily life, and even for most engineering purposes, we find it practical to assume that the earth is flat. If, however, we want not just to build a new garage, but to navigate the seas, the flat earth model is going to prove a serious handicap. In a conversation at the Niels Bohr Institute,

David Bohm was asked if ‘science has shown us something that scientists do not want to see?’ He replied:

Well, they have become so used to their way of seeing it, that they don’t want to change, you see they feel uncomfortable about changing. And they feel there’s no reason to change, they say we’re doing so well now, why should we change. In one sense it looks as if we’re doing very well, but if you look at the broader view, it looks very dangerous.²¹⁶

The purpose of science is not utility: it can never be reduced to ‘how can I most effectively exploit the world?’ Schrödinger was right: science’s aim is nobler than that. It is to understand nothing less than who we are. So the truth matters, and matters greatly. Furthermore, in the context of evaluating science as a path to truth – the purpose of this section of the book – it is, of course, the central issue. And the machine model is found wanting. As von Bertalanffy put it, ‘even as a fiction the machine idea does not attain its goal, because ... it proves to be inadequate in the face of a large and important section of biological data.’²¹⁷

It’s not even as though the fiction of the machine is harmless. It can be seen behind many of the more inhuman consequences of our technological society: our attitudes to both what human life is and to the living world at large. So, again: why does the model persist?

Probably not *just* because of familiarity or utility. The drive behind the machine model is, fascinatingly, much stronger and much less cold-blooded than an explanation on either ground would suggest. The sheer fanaticism of its advocates, and the *animus* directed at those who question the machine model, suggests a more impassioned investment, having little to do with science at its best.²¹⁸ I am inclined to think that one element in the model’s popularity is that it encourages the sense that we can easily understand what life is and learn to control it – Faustian fantasies, in other words, of omniscience and omnipotence, that reductionists quite rightly dislike when they see them attributed to a God (I share their qualms).²¹⁹

Here the attentive reader will hear bells ringing from Part I. Breaking down an entity into its parts to see how it works and attempting to build it up again so as to manipulate and control it are familiar proclivities of the

left hemisphere. So too is the phenomenon of denial, refusing even to countenance that a living organism might not be a machine when the evidence stares us in the face. It is reminiscent of the exclusively left hemisphere-dependent subject in Deglin and Kinsbourne's experiments insisting that a porcupine is a monkey, because 'it says so on the card'. Suggestive of left hemisphere dependency, too, is the facetious dismissal when its account of reality is challenged, something we saw in the cases of patients with right hemisphere dysfunction in Part I; and ultimately so is the anger which is ultimately provoked. The left hemisphere insists on its own vision, thereby interrupting the process whereby that vision needs to be referred back to the right hemisphere, so as to be taken up into the whole, as just one part – a valuable one, without doubt – of an understanding in context. Metaphorically speaking, it is as though many biologists now reside in the left hemisphere's hall of mirrors, and not only cannot find the way out, but have stopped being aware there is a world outside to attain.

The left hemisphere's serial, analytic approach is better equipped to deal with a system that is closed, static, linear and predictable – like a machine; not one that is open, constantly flowing, becoming and changing, and ultimately complex and indeterminate – like life. In the left hemisphere's vision, things take priority over processes. It is good at understanding linear cause and effect, not so much reciprocal interaction, let alone a process of co-creation. It understands a whole as simply the assemblage of parts, and causation as from bottom up only, not from many directions at once within the whole. It is at home when it can follow procedures; less so when it comes to recognising new forms, or fields, at work. It prefers what is clearly defined, to what has imprecise boundaries. It doesn't see *Gestalten*, of which life provides the pre-eminent examples.

This allegiance to the left hemisphere is, then, another reason why, however efficacious biology may have become in terms of manipulating the world, its claims to truth should be treated with care. But clearly a further question arises. If the hemisphere hypothesis, by positing the notion of left hemisphere capture, helps illuminate why biology has found itself in the strange predicament of claiming that black is white, why is it that physics, a science with the same pedigree of attachment to the machine model, should have escaped capture, as we saw in the last chapter that it had?

I think that the answer has much to do with the particular nature of Life. There are a number of aspects to this.

The reader will remember from Part I the difficulty the left hemisphere has with dealing with living things: its preference for inanimacy, its tendency to see parts of the body as lifeless ‘things’, its believing living beings (including the self) to be dead, its seeing people as machines or zombies, and its more general tendency to devitalisation. Then there is its tendency to halt the living flow of natural processes, substituting a succession of static representations, something I will say much more about in Part III. Encountering life, it needs to break it down into bits which can be manipulated and controlled; but life is ultimately recalcitrant to any such process. And, on top of all this, and most important, the left hemisphere can’t handle the concept of something with manifest intrinsic purpose (its own, inner, purposiveness), rather than something manifesting extrinsic purpose, engaged in instrumentalising or being instrumentalised by, its environment and other existing beings – the only kind of purpose the left hemisphere understands, and which is indeed its *raison d’être*.

In Part I, I quoted the philosopher Hans Jonas to the effect that the scientist assumes humans to be subject to causal laws from which the scientist himself is exempt. More than that, however, he saw that in this process inevitably ‘man-the-knower apprehends man-*qua*-lower-than-himself ... since all scientific theory is of things lower than man the knower’:

It is on that condition that they can be subjected to ‘theory’, hence to control, hence to use. Then man-lower-than-man explained by the human sciences – man reified – can by the instructions of these sciences be controlled (even ‘engineered’) and thus used.²²⁰

Philosopher of biology Stephen Talbott sent a draft book chapter to ‘a first-rank molecular biologist’; Talbott quotes from his response:

After describing my views as ‘very interesting, provocative, and necessary’, and before offering his support for much of what I had to say, he voiced this concern: ‘You very explicitly dispense with vitalism. Nevertheless, your piece is permeated by an atmosphere that says “There is something special about living things”.’

‘So I believe there is’, Talbott continues. ‘Animals and plants are a long way from rocks and clouds, and also from automobiles and computers. The need to point this out today is one of the startling aspects of the current scientific landscape.’²²¹

I agree with Talbott that, while there is no need for some ‘vital substance’ to be added for life to come about, there is obviously something special about living ‘things’. It borders on the absurd to deny it: and, as I have argued, organisms are just not machines. In a later chapter I will, however, argue that there is no absolutely hard and fast line to be drawn between the animate and what we call the inanimate. Not, of course, for the sort of reasons that usually lie behind such claims, those of the School of Nothing Buttery. Not, then, that the living is best seen by likening it to the inanimate; but, on the contrary, that the inanimate is best seen, as biophysicist Robert Rosen eloquently explained, as a limit case of the animate. That discussion will have to wait for now. What I want to draw attention to here is the curious phenomenon whereby scientists are made desperately uncomfortable by even the whisper of there being something special about living beings, or of their having intrinsic purposes of their own.

THE 'DREADFUL' QUESTION OF PURPOSE

The problem biology faces, but physics doesn't, is that the phenomena it is trying to explain require it to ask not one question, but two. This has been succinctly pointed out by George Gaylord Simpson:

'How?' is the typical, and only meaningful, question in the physical sciences. But biology can and must go on from there. Here, 'What for?' – *the dreadful teleological question – not only is legitimate but also must eventually be asked of every vital phenomenon ...* In biology, then, a second kind of explanation must be added to the first, or reductionist, explanation made in terms of physical, chemical, and mechanical principles. This second form of explanation, which can be called compositionist in contrast with reductionist, is in terms of the adaptive usefulness of structures and processes to the whole organism.²²²

Biology has a problem with teleology. In J.B.S. Haldane's oft-quoted words, 'teleology is like a mistress to a biologist; he cannot live without her but he's unwilling to be seen with her in public'.²²³ However, avoiding teleology results in vacuity, as the evolutionary biologist Ernst Mayr trenchantly observed:

Teleonomic statements have often been maligned as stultifying and obscurantist. This is simply not true. Actually, the nonteleological translation is invariably a meaningless platitude, while it is the teleonomic statement which leads to biologically interesting inquiries ...' ²²⁴

Mayr is thinking principally of those scientists – and they exist – who want us to avoid making specific teleological observations of behaviour, such as 'a turtle comes ashore *in order to* lay her eggs', by saying 'a turtle comes ashore *and* lays her eggs'. This seems like a hangover from the bad old days of behaviourism, where all inner life is denied, even in humans.

Yet, as Oxford professor of physics Andrew Steane says, ‘the structure of science is not one which dismisses the higher-level categories and “explains them away”. That is not what “scientific” means.’ Even Jacques Monod, an ardent reductionist, who is said (probably wrongly) to have said that ‘nature does not have any intention or goal’, wrote:

one of the fundamental characteristics common to all living beings without exception [is] that of being *objects endowed with a purpose or project*, which at the same time they show in their structure and execute through their performances ... Rather than reject this idea (as certain biologists have tried to do), it must be recognised as essential to the very definition of living beings.^{[225](#)}

Are we talking of the purpose of a single cell, or a single organism, or an evolutionary strain to which the organism belongs? All three: separating them out is to a large extent artificial, since they are different aspects of one process. At the macro level, according to palaeobiologist Simon Conway Morris, the development of the eye – improbably complex as it is – has happened independently 10 times (the camera eye six times and the compound eye four times) over the course of evolution.^{[226](#)} At an intermediate level, a strain of flies, genetically manipulated so as to prevent eye formation, within a few generations produces eyes. At the micro level, a single cell of the creature is capable of reacting to unforeseeable circumstances so as to preserve its function in the whole organism, in ways that suggest intelligence.

In a parallel situation, where the same mechanisms of echolocation in bats and whales were found to have evolved entirely separately, and depending in either case on the same complex co-occurring genetic changes, the first author, Dr Joe Parker of Queen Mary’s School of Biological and Chemical Sciences, London, commented: ‘We had expected to find identical changes in maybe a dozen or so genes but to see nearly 200 is incredible. We know natural selection is a potent driver of gene sequence evolution, but identifying so many examples where it produces nearly identical results in the genetic sequences of totally unrelated animals is astonishing.’^{[227](#)}

Importantly, the idea of teleology, or purpose, does not entail determination: no prior plan, involving a sequence of predetermined steps to bring it about, is required. It is exactly that that is avoided. For example, a young woman may purpose to be a mother, and this purpose may be the most important thing in her life, yet it does not entail a series of steps, nor can its path be predicted. Nonetheless, if it is important, it will tend to happen. A purpose here is not a plan. It is a *tendency* inseparable from – woven into, as it were, the fabric of – a life, which leaves all the detail, and even the final outcome, undetermined. Like ‘at-tending’, tending alters the world and makes it what it is for us. The root, in either case, is Latin *tendere*, to reach out to something – something, then, in front or above. Nothing to do with being pushed, mechanically, from behind or below.

The example can be usefully taken further. It would be easy to see how to *prevent* the purpose succeeding: for it to have a chance of succeeding, the woman must put herself in the way of its coming about. However, that leaves when, where, and with whom, completely undetermined and undeterminable. By doing or not doing certain things, the desired outcome can be made more likely. Both at the individual and universal level, purpose exists through what one might call a shaping of the probability landscape. Thus we tend towards certain ends, while leaving exactly what happens, and how, in any one case, undetermined.

To move from a focus on things as the ultimately important constituents of reality, to one in which processes are the important entities, requires a shift in our perception of space. We relinquish the idea of causation as strictly ‘bottom up’, from parts to wholes: we come to accept that whole systems contribute to the properties of their parts.²²⁸ The first is the only one that makes sense to the left hemisphere; in its view the whole can be understood only if we understand the parts. It takes the right hemisphere to understand that the parts can be understood only in the light of the whole.

But it also involves a shift in our perception of time. It is not just that chains of causation work from the past towards the future: the future, in the sense of internalised potential, pattern or *telos* – may be as important a driver in the emergence of phenomena as the past. As Joseph Woodger says, ‘in regard to the explanation, a knowledge of the *outcome* of a biological process is often more illuminating than knowledge of what went before.’²²⁹

Form in living creatures is, despite appearances, another aspect of the question about purpose: both imply a tendency, a direction of intent, an

overall attractive outline. Some ‘sense’ of this, as Woese and McClintock would say, is what enables the organism to repair, or correct, itself. In other words, to correct itself is an inclination towards a form that is its goal, towards a goal that is its form.

The purpose I am talking about is nothing extrinsic, but rather intrinsic potential that is fulfilled within a process as the process unfolds. ‘Latent within the polymeric sequence of amino acids that constitutes the enzyme’s primary structure’, writes Stein, ‘is directionality and potential for its correct folding into a catalyst of remarkable power and selectivity.’²³⁰ The forms that are required in the enzyme, in the cell, in the tree, may not be achieved by pushing from behind, but by drawing from in front, towards certain ends, certain conformations, certain attractors, much as a valley ‘draws’ water that falls evenly on the surrounding hills to one clear end: the mouth of just one river. There is stored attractive energy in the formation of the landscape.²³¹

So a system, including a cell or a multicellular organism, can be free and undetermined, yet despite the occurrence of random events, exhibit patterned and purposeful behaviour. To quote Paul Weiss:

Small molecules go in and out, macromolecules break down and are replaced, particles lose and gain macromolecular constituents, divide and merge, and all parts move at one time or another, unpredictably, so that it is safe to state that at no time in the history of a given cell, much less in comparable stages of different cells, will precisely the same constellation of parts ever recur . . . [yet] their joint behavior converges upon a nonrandom resultant, keeping the state of the population as a whole relatively invariant.²³²

Mutations have been supposed to be random with respect to fitness: those that bring benefit persist, those that do not die out. But such a claim requires clarity about how to judge fitness. This is far from straightforward. There is no clear way of determining fitness except in that a thing *does survive*, which is circular. The geneticist Theodosius Dobzhansky – the same man who said that ‘nothing in biology makes sense except in the light of evolution’ – wrote that no biologist ‘can judge reliably which “characters” are useful, neutral, or harmful in a given species’ (see note).²³³

Geneticist Henrik Kaessmann points to the recent discovery of protein-coding genes being composed *de novo* ('from scratch'), ie, from non-protein-coding genomic sequences altogether unrelated to pre-existing genes or transposable sequences. Such creation was widely thought to be virtually impossible: indeed, according to the famous French biologist François Jacob the probability for creation of new protein-coding genes *de novo* by random processes 'is practically zero'.²³⁴ And yet 'recent work has uncovered a number of new protein-coding genes that apparently arose from previously noncoding (and nonrepetitive) DNA sequences'.²³⁵ What is more, according to another research team, there is 'accumulating evidence that *de novo* evolution of genes from noncoding sequences could have an important role' in a class of genes representing 'up to *one third* of the genes in all genomes'.²³⁶

As Talbott points out, there has, until recently, been what looks like a doctrinaire assumption of randomness projected onto 'a descriptive biological literature that, from the molecular level on up, remains almost *nothing but* a documentation of the meaningfully organized, goal-directed stories of living creatures.' And he continues:

Here, then, is what the advocates of evolutionary mindlessness and meaninglessness would have us overlook. We must overlook, first of all, the fact that organisms are masterful participants in, and revisers of, their own genomes, taking a leading position in the most intricate, subtle, and intentional genomic 'dance' one could possibly imagine. And then we must overlook the way the organism responds intelligently, and in accord with its own purposes, to whatever it encounters in its environment, including the environment of its own body, and including what we may prefer to view as 'accidents'. Then, too, we are asked to ignore not only the living, reproducing creatures whose intensely *directed* lives provide the only basis we have ever known for the dynamic processes of evolution, but also all the meaning of the larger environment in which these creatures participate – an environment compounded of all the infinitely complex ecological interactions that play out in significant balances, imbalances, competition, cooperation, symbioses, and all the rest, yielding the marvellously varied and interwoven *living communities* we find in savannah and rainforest, desert and meadow, stream and

ocean, mountain and valley. And then, finally, we must be sure to pay no heed to the fact that the fitness, against which we have assumed our notion of randomness could be defined, is one of the most obscure, ill-formed concepts in all of science.²³⁷

In an earlier chapter I suggested that attempting to break down the *Gestalt* of the cat into a host of useful separate adaptations that enable it to hunt well, and then being faced with the question of what started the process and what led to what, creates its own problems. It is the linear, serial processing which the left hemisphere imposes on what is a complex whole. Similarly,

the evolution of complex adaptations requires coordination between an organism's various developmental systems. For example, the adaptive evolution of tetrapod limb structures requires coordination between the development of bone, muscle, nervous, circulatory, and integumentary systems (at least). If each system had to wait for a fortuitous mutation in order to produce the appropriate accommodation, complex evolutionary adaptations might never arise.²³⁸

There are aspects of the evolutionary process, as Scott Turner puts it, that 'make little sense without intentionality of some form guiding them'.²³⁹

To return to purposive behaviour in an individual organism. According to Ford, 'our conviction that these phenomena become manifest only through cell communities is a fundamental misconception. Ingenious, perceptive and intelligent behaviour is apparent in a single living cell.'²⁴⁰ No-one who has ever done such a homely thing as look at drops of pond water under a microscope would ever fall for the idea that purposive, intelligent behaviour is not exhibited at the level of a single cell. 'Single cells truly can consider their options', writes Ford, 'and modify their responses in the light of contingency':

Under the microscope, we can observe a predatory single-celled ciliated microorganism as it inspect its prey from a distance. The

ciliate can then select a specific microbial cell, pause, and then swoop upon its prey and capture it within a second. The coordination of this activity is similar to watching a cat catch a sparrow on the lawn, yet it is done within the confines of a single cell. Living cells are smart: the ciliate *Spirostomum* has been shown to possess memory.²⁴¹ It can be trained.²⁴²

Describing how cells often act apparently as individuals, so as to ‘seek out and destroy an invading pathogen without external mediation’, if necessary altering conventional behaviour to pursue it, and ‘maintain pursuit relentlessly until the organism is consumed and eliminated’, Ford reminds us that the human polymorph, a white blood cell that forms an important part of the body’s immune defences,

is an amoeba, although a constituent part of our bodies. This is a cell with a mind of its own. Conceptualising the human body as a cooperative community of essentially autonomous entities gives us a more reasonable understanding than our modern models, which see the body as a collection of mechanical organs enclosed in skin.²⁴³

Such behaviour, ‘including the continual and carefully choreographed machinations of mitochondria, the endless migration of granules and voiding of vacuoles, the conduction of discrete particles in two-way streams of cytoplasm like traffic on a highway, the meticulous changes of position of the nucleus in diatoms during division, and the cautious inspection of prey by a predatory ciliate’,²⁴⁴ leads us to see something inexpressibly more complex than we can explain, never mind understand. ‘Our failure to appreciate the majesty of the cell is astonishing, and our sublime confidence that we are close to an understanding [of] it is an embarrassment’.²⁴⁵

Slime moulds are amoeba-like organisms found on moist decaying organic matter. Clearly they have no neurones, each consisting of just a single, giant cell. They are, however, capable of behaviour that looks intelligent. They are attracted to one another and fuse, creating a plasmodium, which may be up to several metres long – the slime mould that is visible to human eyes. This plasmodium is essentially a flat, liquid-filled sac, but it behaves like an organised colony:

Every part rhythmically expands and contracts, pushing around the fluid inside. If one part of the plasmodium touches something attractive, like food, it pulses more quickly and widens. If another part meets something repulsive, like light, it pulses more slowly and shrinks. By adding up all of these effects, the plasmodium flows in the best possible direction without a single conscious thought. It is the ultimate in crowdsourcing.²⁴⁶

These plasmodia can make decisions, comparing different options (for example, food sources) and selecting the best one: the plasmodium touches all the potential meals and then either ‘decides’ to move towards one, or splits itself among many. It can even balance its diet.²⁴⁷ A mould can forage while making decisions with more than one objective, and it can be persuaded experimentally, as can humans, to behave irrationally at times.²⁴⁸ It even turns out that moulds make better decisions if they are not rushed.²⁴⁹

Plasmodia regularly break out of Petri dishes in laboratories, and can escape from traps and solve mazes.²⁵⁰ Slime mould colonies can learn to avoid certain paths that lead to a noxious stimulus, and moulds that have so learnt can transfer this memory of the adaptive response by cell fusion to new colonies that have never encountered the noxious stimulus. Even in cases where three out of four moulds in the fused organism were ‘naïve’ and had had no opportunity to learn, the information was transferred to the resulting fused slime mould from the one that had had the noxious encounter.²⁵¹

Does a slime mould have awareness? If it does, and I suspect it does, the awareness cannot be much like ours. It does have memories and would seem to act intentionally upon them. According to Scott Turner, ‘arguably, the roots of our own intentionality permeate deeply through the living world: the living world may be rife with intentionality.’²⁵² I believe this to be a reasonable deduction, and will have more to say about it in Chapter 27.

It seems to me that an explanation in terms of a whole that follows attractive formal patterns or fields – *Gestalten* – is better than an explanation in terms of chains of causation of parts. That we cannot as yet ‘see’ or measure such patterns or fields should not be a definitive argument against entertaining the possibility of their presence. Many physical forces

cannot be directly visualised or measured: we posit their existence only on the basis of their apparent effects.

Such is the case with a magnetic field. We visualise it through its effects on metallic bodies. Below is a simple illustration from D'Arcy Thompson, showing cytokinesis (a phase of cell reproduction) in a fish egg. The similarity to iron filings in the magnetic field of a bar magnet is so striking that it has been remarked on for 150 years.²⁵³

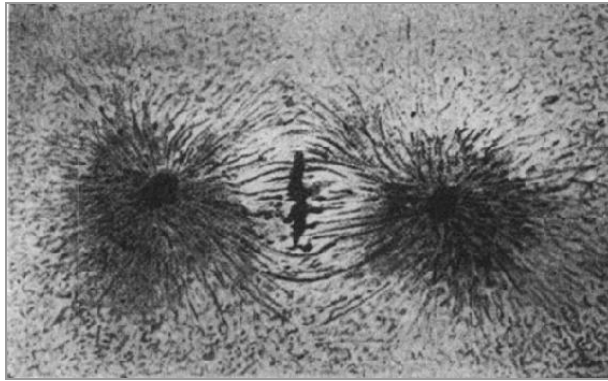


Fig. 28. 'Caryokinetic figure in a dividing cell (or blastomere) of a trout's egg. After Prenant, from a preparation by Prof Bouin.' (from Thompson 1992, 299)

ATTEMPTS TO SAVE THE MACHINE MODEL IN BIOLOGY

Allowing in the notion of purpose may seem ‘dreadful’ to most orthodox biologists clinging to the machine model, but of course that model itself does not dispense with the issue of purpose: it merely tries to brush it under the carpet. Every machine we know of is designed by an intelligent mind that is external to the machine, conceives the design before building it, and creates it for his own utility, a purpose that is extrinsic to the machine itself. Even a machine that makes another machine does so only because an intelligent mind that is external to both machines programmed, and purposed, the first to make the second. The machine is an embodiment in the external world of human will (whose residence is largely the left hemisphere) to some purpose, and the trail of causation inevitably returns, ultimately, to that source.

Clearly, if organisms are seen as mechanisms, there is a problem here. Because machines do not make themselves. Obviously one machine can make another, but no machine simply makes itself. Saying that this one ‘just does’ – La Mettrie’s ‘clock that winds itself’²⁵⁴ – is to say that it is, blatantly, not helpful to compare it to a machine. As Nicholson says,

the trouble with design-talk in biology is that, as we have already discussed, organisms are not extrinsically purposive objects ... The very idea of ‘design without a designer’ is not only deceptive – it is also logically contradictory: ‘design’ means made by a designer.²⁵⁵

On the one hand, biologists speaking the language of mechanics do not want to invoke a heavenly engineer (nor do I); but on the other, as I have already suggested, few biologists any longer believe that just waiting for the right sequence of accidents – random mutations – is how nature works.

One solution to this conundrum is genetic animism – Dawkins’s genes with an agenda. Externality and instrumentality are inescapable logical requirements in whatever it is that one claims drives the machine model. So for genes to do the necessary work to support the machine model, they must both carry the idea of instrumentality, and be in some way external to – ontologically, causally and temporally *prior* to – what they are making (the

rest of the organism). But this gambit ‘promotes the misunderstanding that DNA stands in contradistinction to the rest of the components in a cell by virtue of its ability to exert executive power over cellular operations’.²⁵⁶ We have seen that this falls down on every count. DNA is not ontologically, causally or temporally prior to the cell, nor does it stand over against the cell in any sense, bring it into being for a purpose, or simply exert power over it.

The other possible gambit to save the machine model is really just to reinvent God, put his eyes out, and call him by another name.²⁵⁷ The analogy of the world to a watch, which implied the existence somewhere of a watchmaker, was used by the English clergyman William Paley to buttress his argument for a God. Dawkins, the author of *The Blind Watchmaker*, used the same analogy to buttress his argument against God. He writes that ‘I suppose people like me might be labelled neo-Paleyists, or perhaps “transformed Paleyists”’.²⁵⁸ However, this does not help, for two substantial reasons: organisms are not at all like a watch; and evolution ‘simply does not proceed like a watchmaker, blind or otherwise’, as Nicholson points out.²⁵⁹ Both Dawkins and Paley make the same mistake, as Dawkins himself hints.

It has been argued that there might be a way out: that there is no need of a watchmaker, blind or otherwise, since complex structures can arise ‘naturally’ without a will that already conceives what it is that is being built. They ‘just do’. Fair enough: as I say, I am not arguing for an external mechanic, either. But, although the statement may well be true, it is in itself no form of explanation. It merely states as a fact the very thing that was required to be explained and remains to be explained. It simply kicks the can down the road. This would not matter (after all, no sane person thinks they can ‘explain’ the workings of life or the universe), if it were not offered in the spirit of having settled something at last.

The principle relied on in such accounts is that of self-organisation. As to what exactly self-organisation means, let me quote an authoritative source:

To express as clearly as possible what we mean by self-organisation in the context of pattern formation in biological systems, we provide the following definition: *self-organisation is a process in which pattern at the global level of a system emerges solely from numerous*

*interactions among the lower-level components of the system. Moreover, the rules specifying interactions among the system's components are executed using only local information, without reference to the global pattern.*²⁶⁰

On the basis of what we have considered so far, never mind what we are to consider later in the book, this looks like a deeply problematic claim. Since it is impossible to rule anything out definitively, I will not say 'impossible', but, all things fairly considered, 'improbable'. It seems merely an expression of a dogma, that of reductionism.

Turner writes: 'To honestly deal with the question at hand here – where does design come from? – there is no way of avoiding the problem of intentionality: it is the 800-pound gorilla sitting in the corner.'²⁶¹ This is surely wrong: the gorilla is sitting, not in the corner, but in the middle of the room. 'The living world is not only a designed place', he concludes, 'it is, in its peculiar way, an *intentionally* designed place ... a living phenomenon replete with the purposefulness and intentionality that is the fundamental attribute of life itself.'²⁶² Let me say, before the howls begin, that neither he nor I are arguing for an engineering God. What we have to explain is how there is order, complexity, beauty and purpose, while at the same time accepting that what we are dealing with is not a machine, and it has no *extrinsic* purpose, such as a machine has – it does not fulfil, in what would have to be an instrumental fashion, the purposes of something external to it.

There's a good deal more to say on purpose and design, and it's something I will return to towards the end of the book (see Chapter 27).

In a last ditch attempt to save the machine model, it may be objected that some machines can, or could potentially, be so programmed as to simulate some of the behaviours of organisms. With the growth of expertise in artificial intelligence it might in theory become possible for machines to simulate some of the operations of an organism less approximately, although the sheer scale of complexity involved in simulating the growth, regulation and development of a single cell – or part of a cell – is so daunting that I wouldn't be inclined to hold my breath. 'A single neuron would be more than enough for us to tackle, and even that is probably not amenable to our primitive methodologies', wrote Ford in 2017:²⁶³

For centuries, we have been led to envision life as machinery. The simplistic belief that the brain is a computer, and can be analysed through electrochemical means, is no longer sustainable ... The unfathomable complexity of a living cell is not generally appreciated; even a simulation of the way a mitochondrion moves would be beyond our current conventions. Emulating fragments of our trivial understanding does not explain their intricacy, for cells are intelligent, and they live lives that we have hardly begun to address.²⁶⁴

Often mentioned in this context are servomechanisms, whereby feedback is employed to make a system self-regulating: like a thermostat, the machine incorporates elements that enable it to achieve an equilibrium. However, organisms are open, far-from equilibrium systems; and as Nicholson points out, ‘servomechanisms are closed, near-equilibrium systems and consequently they are not capable of truly adaptive self-maintenance.’²⁶⁵ Adaptive: remember McClintock’s unpredictable adaptations to unforeseen circumstances?

But suppose for the sake of argument that such machines could be made: what then? Once the machine model is so transformed that it is no longer in any recognisable sense mechanical, it has lost its point. If, in order to make humans appear like machines, you have to posit machines that appear like humans, the metaphor is no longer doing any work. Nicholson takes the example of a paper by Reginald Kapp entitled ‘Living and lifeless machines’, in which

Kapp notes that ‘the living body is analogous to a motor car in which the chassis, brakes, cylinders, pistons, connecting rods, valves and bearings all contained combustible material, some of which was burnt whenever the driver placed his foot on the accelerator’.²⁶⁶ The question we must ask is this: how is such a bizarre imaginary motor car still analogous to an actual motor car? ... what is the point of clinging on to the [machine concept of the organism] if the price to be paid is that our understanding of machines has to be completely distorted in order to accommodate the characteristic attributes of organisms?²⁶⁷

Kapp is by no means the only author to stretch the machine concept beyond breaking point. The history of biology is, according to Nicholson, 'littered with memorable examples'. The attempt is reminiscent of an old joke:

What's green, hangs on the wall and whistles?

I give up.

A kipper.

But a kipper isn't green!

Well, you could paint it green ...

And it doesn't hang on the wall!

Well, you could hang it on the wall, couldn't you?

Anyway, it certainly can't whistle!

Look, what do you expect – to have the answer handed you on a plate?

All attempts at stretching the machine model in one form or another come down to repeating de La Mettrie's absurdity, that of a 'clock that winds itself'.²⁶⁸ The correct conclusion to draw is not that some watchmaker, blind or otherwise, did or does wind the machine, but that it is not a machine.

THE STREAM OF LIFE – A BETTER MODEL?

The words for Nature in Chinese, *tzu-jan* (*ziran*), and in Japanese, *shizen*, mean whatever is ‘of itself’, exists ‘spontaneously’, is ‘just what it is’. They are, in origin, adverbs, not nouns – ways of being, not things.²⁶⁹ If there is anything in this ancient perception, and I believe there is great wisdom in it, a vision of the natural world as a thing, and a mechanical one at that, is bound to restrict our understanding of what we are dealing with to a certain rather alienating perspective. A machine implies existence of an external creating force with its own purpose: Nature delights in her own.

In the history of Western philosophy there is a distinction between nature considered as *natura naturans* (nature ‘naturing’) and as *natura naturata* (nature ‘natured’), a distinction which, in that form, probably goes back to the early thirteenth-century polymath and scholar Michael Scotus, but is derivable from Aristotle.²⁷⁰ Famously, it was later taken up by Spinoza and Coleridge. It is the distinction between an eternally becoming, never completed, self-creating Nature, on the one hand, and an already finished, passive Nature, created by a cause external to herself, on the other. The second of these, *natura naturata*, suggests reification (‘thingification’), and, I submit, the view of the left hemisphere; the first, *natura naturans*, suggests flow, and the view of the right hemisphere. (As Arran Gare points out, Friedrich von Schelling, a late eighteenth- and early nineteenth-century philosopher whom we will encounter repeatedly at key points on the path ahead, foresaw many of the developments that have taken place in the post-mechanical science of the twentieth century: his influence was acknowledged by the physicist Hermann Weyl;²⁷¹ he was the first to describe the central concept of homeostasis, as well as process biology and was an influence on Haldane and Waddington; and laid foundations for both complexity theory and evolutionary epistemology, as well as the idea of the Earth as a living organism, which we now think of as the Gaia hypothesis.)²⁷²

Our troubles in this area, as in so many others, begin with the tendency to start from *things*, as though they were the important underlying elements in what we are looking at. Physicists have come to realise that the phenomena they are dealing with, though they may have some thing-like

properties when viewed from a certain perspective, are better seen as processes. The ‘building blocks’ of the supposedly mechanical universe behave like patterned flows of energy, or force fields: they are constantly moving and changing, have no precise boundaries, overlap and mingle with other equally elusive entities, cannot be precisely predicted or specified, change their nature and behaviour depending on circumstances and context, including whether or not they are observed, and exhibit behaviour that defies any mechanical principles – for instance, a ‘particle’ showing interdependency, or entanglement, with another too far removed across the universe for information of any kind to have had time to travel between them. Matter, it seems, is just, as Einstein confirmed, a particular manifestation of energy; not static and substance-like, but constantly in a state of flow.

Thingness places the emphasis on distinctness and stability; the problem then is to explain how things come to change, to move, to be connected, to overlap with other things, to change their nature when observed, or when the context changes. On the other hand, thinking in terms of patterned flow places the emphasis on interconnectedness and change; the problem then is to explain how apparently distinct entities arise for a while, and how it is they contrive to remain temporarily stable.

John Haldane went so far as to say ‘the conception of a “thing”, or material unit, is ... useless in the interpretation of distinctively biological facts’.²⁷³ But his point applies not only to organisms, and it is not just confined to descriptions at any one particular scale. Science always deals with processes, everywhere, and at all scales. That is its nature, and it is why science is such a wonderfully living business. ‘Classical science emphasized order and stability’, wrote the chemist and Nobel Laureate Ilya Prigogine. ‘Now in contrast, we see fluctuations, instability, multiple choices, and limited predictability at all levels of observation.’²⁷⁴

The most static of sciences might appear to be geology; yet its subject matter is, as philosopher Peter Simons points out, eruptions, earthquakes, the formation and erosion of rock and soil, the movement of tectonic plates, the dynamics of precipitation, the formation of rivers and much else. Astronomy deals with the explosion of supernovae, bursts of gamma radiation, the formation and decay of stars and planetary systems, and the rotation of galaxies.²⁷⁵

In chemistry, too, the fundamental entities are processes. According to Ross Stein, the molecule endures through time, maintaining its identity, like a macro-system, ‘not because it is static and unchanging, but rather because it is a dynamic system’: molecules are ‘dynamic entities that negotiate complex energy landscapes.’²⁷⁶ In physics, nothing rests even for a moment: electromagnetic radiation is emitted, propagated and absorbed; there are constant fluctuations in field values.²⁷⁷ As philosopher of science Mark Bickhard writes:

the best contemporary physics demonstrates that there are no particles at all. The fundamental constituents of the world, according to quantum field theory, are dynamic quantum fields in a dynamic space-time. Quantum fields manifest *particle-like* properties in virtue of their interactions being constrained to occur in multiples of fixed quanta, and the conservations of those quantised properties. The quantisation is *reminiscent* of particles, but it is in fact a quantisation of wave-like processes, not particles ... *there are no physical particles* ...²⁷⁸

Dupré and Nicholson take the argument further by positing that particles are the product of a way of attending:

Quantum fields, which are dynamic organizations of energy distributed in space-time, appear to have purged classical notions of elementary particles from the ontological picture ... Although contemporary physicists still routinely speak of ‘particles’, these no longer refer to solid micro-entities or tiny impenetrable granules, but to quantised excitations of particular fields. Quantum fields, in other words, are primary, and the various kinds of particles that physicists refer to are derivative entities, appearing only after quantisation.²⁷⁹

Niels Bohr thought it would be a step forward to eliminate the term ‘particle’ altogether.²⁸⁰ It was too much like a thing. Thus what were formerly considered the primary ‘building blocks’ of matter have been replaced by ‘statistical patterns, or stability waves, in a sea of background activity.’²⁸¹ And in the early 1950s von Bertalanffy, in a beautiful and

succinct formulation, made an explicit analogy between physics and biology:

As in modern physics there is no matter in the sense of rigid and inert particles, but rather atoms are node-points of a wave dynamic, so in biology there is no rigid organic form as a bearer of the processes of life; rather there is a flow of processes, manifesting itself in apparently persistent forms.²⁸²

It seems to me that the reason that the world looks different at the very small scale from how it looks at the level of the everyday has as much to do with time as it does with space. When we are looking at the molecular, and much more at the subatomic, level, processes are happening very fast indeed compared to the period of human observation. At the macroscopic level processes are generally slower. And this makes a crucial difference to what we seem to see. To quote John Dupré again:

Mechanistic explanations will be successful only to the extent that the constituents identified are sufficiently stable on the timescale of the phenomenon under investigation ... their success should not be taken as a sufficient reason for inferring that the organism really is an interlocking system of mechanisms. It is not.²⁸³

From where I am sitting I see the mountains of Skye, and Uist over the water. If a time-lapse camera had been set up to record this scene from the origins of the world to the earth's eventual destruction, we would see these emblems of enduring facticity rise quickly like waves and then, more slowly, fall away into nothingness.²⁸⁴ The most solid-looking manmade objects in the world, say the pyramids of Giza, are quicker, smaller waves – but waves they are. They look static only because relative to our period of possible observation they are flowing slowly. And so it is with everything. Whether something is considered static or flowing is only a matter of scale.

Both in time *and* in space. If we stand on the mountains, instead of looking at them afar off, we see that, at the level of the stone and earth and dust beneath our feet, the mountains are changing and flowing to some extent all the time; go on down to the level of the atom and beyond, and we

find that all is, once again, wholly a matter of flux. Stasis is just an illusion of observational scale, both spatial and temporal.

Scale – quantity – also changes quality in a broader way. This is something we seem inclined to forget: we often seem to believe that if something is good as it is, more of it must be better still. But quantity, always and everywhere, changes quality. And though this fact is nowhere more important than in the realm of human everyday experience, human society and human civilisation, it is also true of all systems. *Qualities* that obtain at the small scale disappear, and others come into being, emerging as the scale and the degree of complexity changes.

Importantly the left hemisphere and the right hemisphere have different takes on both space and time. It is something I will deal with at greater length in Part III. In brief, the narrow, piecemeal scope of the left hemisphere, together with its desire for precise targeting, aims to freeze its object, and hold it motionless in a slice of time; the broad, sustained scope of the right hemisphere, and its desire to see the whole, allows it to appreciate flow, what one might call the depth of time. Similarly the left hemisphere flattens space, so as to produce, once again, a slice, while the right hemisphere, seeing the whole of the world in the round, appreciates depth in space.

A single peripheral nerve acts as a seamless functional unit, every part contributing to the same goal. Yet if we take a slice across it, as if interrupting flow in time, it looks like this:

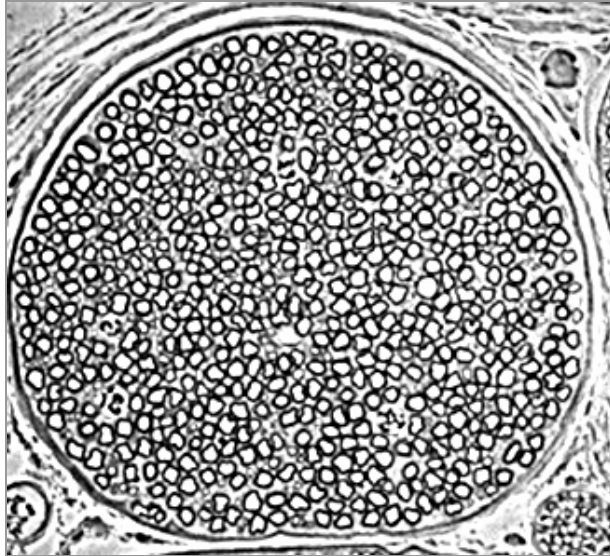


Fig. 29. Transverse section of a peripheral nerve

It seems to consist of a lot of separate units: how does it come about that they are they related? However, if viewed along its length, the nerve looks like this:

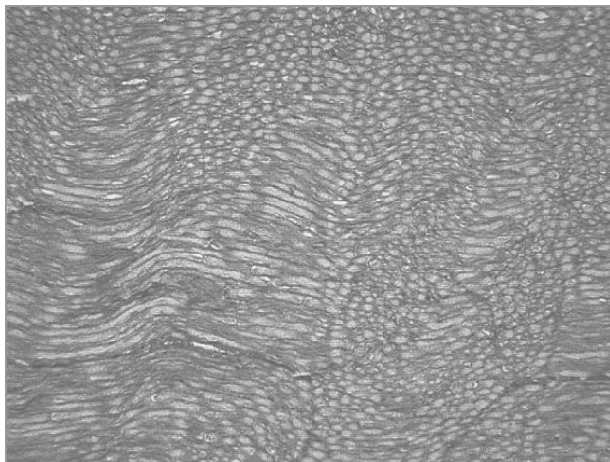


Fig. 30. Longitudinal section of a peripheral nerve

What were previously separate particles are now seen to be interlocking waves.

The ancient Chinese saw this problem, and expressed it as the way one looks at grain in bamboo: ‘on the straight it is of one kind, on the transverse it is of another kind. So the mind-heart possesses numerous principles.’^{[285](#)}

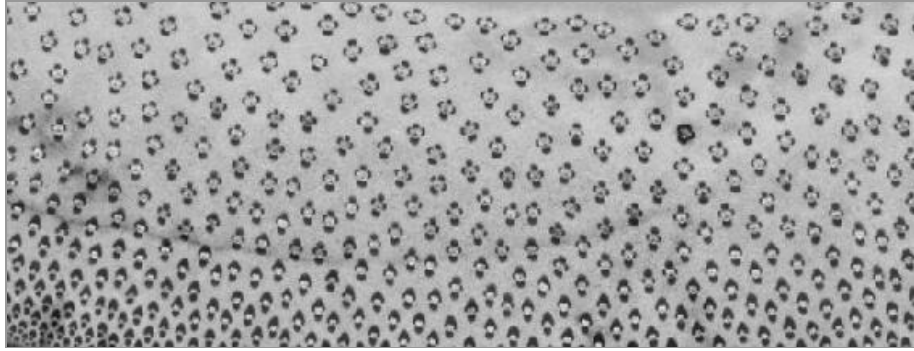
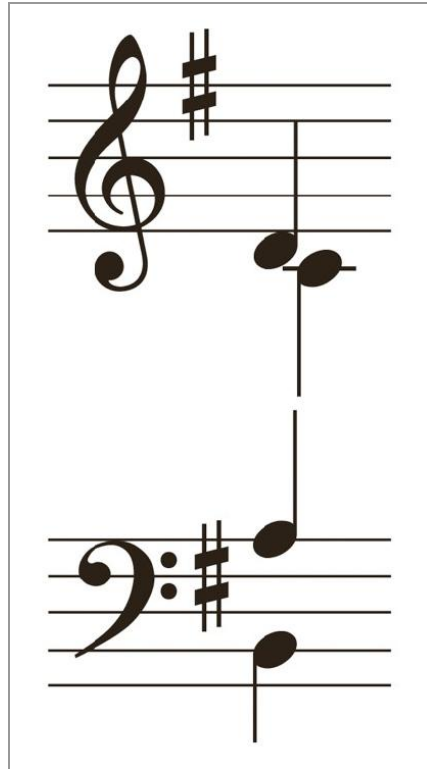


Fig. 31. Transverse structure of bamboo



Fig. 32. Longitudinal structure of bamboo

The best analogy is with music. Take this chord from the end of the *loure*, the sixth movement of Bach's French suite no 5 in G major:



This constellation of notes makes no sense at all on its own and is a howling discord: the notes A, B, C and D are sounded simultaneously. Try it, if you have a keyboard to hand. However, in the context of the flowing lines that harmonise together, it does not sound discordant, but takes its place in a pleasing resolution of lines designed to be heard together, and making sense only in relation to one another:



Once the left hemisphere has frozen its object in time, and decontextualised it in space, it is left with fixed, clear, distinct but inert parts, which then have to be reconnected and reanimated; the building

blocks have to be put together again, and the power, as it were, switched on. To the right hemisphere these ‘objects’ are already connected, animate, and in motion: the power was never switched off.

The left hemisphere’s take on change is that it must consist of the rapid succession of one static element by another. This may look like flow, but it is in fact its opposite: a concatenation – a chain of elements that are themselves static, and distinct – which do not merge one with another. There are always gaps, however infinitesimal, between the entities we imagine as things. This stasis and disconnexion is nowhere to be found in flow.

Discreteness and flow are both aspects of reality, but the latter is ontologically prior to the former. What quantum field theory has to say about this I will postpone to Chapter 24; for now I will content myself with quoting David Tong, Professor of Theoretical Physics at Cambridge:

At a fundamental level is nature discrete or continuous? I see no evidence whatever for discreteness. All the discreteness we see in the world is something which emerges from an underlying continuum ... Quanta are emergent ... they are not built into the heart of Nature.’^{[286](#)}

Analysis never stops until it reaches unchanging particles: if these parts took to changing (and they do), it would have to split them up in their turn.^{[287](#)} It can end only once separation and stasis have been achieved. The difference between flow and the rapid substitution of static elements may sound no big deal, especially since the invention of ciné film, and subsequent digitised media. But it changes a whole host of things.

Living beings cannot be understood simply by reducing them to an aggregation of parts. Knowledge of the parts can often bring useful information, but that is not the same thing. And in today’s science establishment what is most highly rewarded is seeing minutiae in the whole – the more minute the better – not the whole in which the minutiae inhere. Both exercises are important: according to Schrödinger, much more the latter.

Models are very powerful predictors of the path science will take, and the findings it will encounter. If it is true that each science progresses from

an initial conception of its relevant phenomena as *things* – substances such as phlogiston or vital fluid – to one in which they are seen as *processes*; and if it is true that, as Mark Bickhard asserts, process is now ‘the dominant language of science’, exceptions remain. What are they? Oddly, as he points out, ‘the sciences and philosophies of mind and persons. Here substance and structural views are still dominant.’²⁸⁸ This is just as David Bohm predicted.

Trying the stream of life model would be worth it, just to see what it revealed, even if it didn’t look like a much closer fit – as it seems to me it clearly does. The stream of life model is more capacious than, and is able to accommodate, the strengths of the machine model for what it is worth, where it helps: it maintains what Dupré calls ‘as much analytical sharpness as reality allows’, while giving full acknowledgment to fluidity and flexibility.²⁸⁹

But seeing life as a stream is also a model, just as the seventeenth-century Cartesian machine is. And a model is only truer than another if it explains more of the phenomena we see – or have *failed* to see, because of the tyranny of the formerly ruling model. The new model, too, can be jettisoned, when the time comes, once it has done its work. But to judge it fairly does require deploying it, and mentally inhabiting it for long enough to see what difference it makes to the observed world. In other words, you won’t even be in a position to see what it has to offer without first making a leap of imagination.²⁹⁰ Dismissing it just because it isn’t the model you now hold is senseless. In a well-known formulation, ‘you don’t see something until you have the right metaphor to perceive it’.²⁹¹

In 2004, Carl Woese, whose work revolutionised microbiology, wrote of the complacency he saw in biology at that point in history:

Look back a hundred years. Didn’t a similar sense of a science coming to completion pervade physics at the nineteenth century’s end – the big problems were all solved; from here on out it was just a matter of working out the details? *Déjà vu!* Biology today is no more fully understood in principle than physics was a century or so ago. In both cases the guiding vision has (or had) reached its end, and in both, a new, deeper, more invigorating representation of reality is (or was) called for. A society that permits biology to become an engineering discipline, that allows that science to slip

into the role of changing the living world without trying to understand it, is a danger to itself.²⁹²

And he concludes, in an image that should resonate in the mind of the reader: ‘molecular biology could read notes in the score, but it couldn’t hear the music’.²⁹³

Let us return to our overarching context, which is, after all, the examination of science’s claims on truth. I am a believer in Pragmatism. Science is Pragmatist, or should be; not merely pragmatic. The machine model may be useful at times, but it is not accurate, because, as I have tried to show, it does not answer to what we know of organisms from observation, examination, and experiment – in other words from science as she should be practised. This trade-off between truth and utility is also that between the dispositions of, respectively, the right (more truthful, but more complex) and left (less truthful, but simpler) hemispheres. Unfortunately, science’s claims on truth are compromised if they are hijacked by the left hemisphere refusal to acknowledge the limitations of its chosen model of re-presentation (here, the machine model). And, as I say, it is not as if this hijack has no consequences in the world of every day: the consequences are of the most serious nature.

How would a paradigm shift, such as the one I believe we need, change the way we thought of ourselves – influence, in other words, how we answered Plotinus’s question?

In the first place, it would help us, quite simply, to avoid viewing ourselves as machines, the most crippling possible distortion of what it means to be a human being. Believe it or not, in the Royal Institution Christmas Lectures for 2013 (‘the UK’s flagship science series’, according to its website, aimed at aspiring young scientists), an Oxford biology lecturer used the very specially human act of two people gazing at one another to impress on her indeed impressionable audience of 11–18 year olds that ‘you’re amazing, we’re all amazing, because we’re all hugely complicated *machines*...’²⁹⁴ Perhaps it had slipped her mind that machines are not social beings; that they don’t have consciousness, feelings, personality, will or individuality; that they have no appreciation of music, dance, poetry, art or nature; that they have no sense of humour and they do not have the ability to change their minds, to sorrow over the past or project a delighted future. And that’s not even taking into account the far more

complex issues entailed in human consciousness, including imagination, morality, creativity, the capacity for spiritual awe, and an allegiance to beauty, truth and goodness. And in case that should sound the slightest bit rarefied, I'd like to mention that they don't have bodies either. And they do not die. It is true, of course, that you're amazing, we're all amazing; but it's precisely because we are *not* just hugely complicated machines. If we carry on talking like this to the aspiring young, we will get no better scientists than we will deserve.

As biochemist Addy Pross writes, this dire process begins at the cellular level:

There is a growing awareness of an elephant in the room. Life is more complicated than a representation provided by a string of 3 billion letters. The gap between the elucidation of the human genome sequence and understanding the significance of that sequence is cavernous. The uncovering of more and more structural and mechanistic information within the living cell hasn't clarified what life actually is ... Our attempts to view biological systems as mechanical–materialistic machines have failed dismally.²⁹⁵

And those attempts are encouraged by the fact that scientific research into the human being, and specifically into the brain, is almost exclusively carried out using the model, and the language, of the machine. Neurospeak is replete with references to 'wiring', 'circuitry', 'modules', 'switches', 'signals', 'data banks', 'inputs', 'outputs', and to the brain 'encoding', 'computing', and having 'mechanisms' of every conceivable kind: and no-one knows better than I do from personal experience how hard such terms are to avoid, given the existence of the culture. Yet Berry is surely right to say that 'we should banish from our speech and writing any use of the word "machine" as an explanation or definition of anything that is not a machine. Our understanding of creatures and our use of them are not improved by calling them machines.' It is to be expected that the hermetic response of the left hemisphere will be that living creatures are machines. But we do not know that: we only see the mechanical aspects revealed by our model, and I hope in the course of this book to give the reader some insight into how limiting and damaging this habit has become. The language we use is

hugely important: it determines what we can understand. ‘Over the past fifty years or so’, wrote David Mermin in 1990,

scientists have allowed the conventions of expression available to them to become entirely too confining. The insistence on bland impersonality and the widespread indifference to anything like the display of a unique human author in scientific exposition, have not only transformed the reading of most scientific papers into an act of tedious drudgery, but have also deprived scientists of some powerful tools for enhancing their clarity in communicating matters of great complexity. Scientists wrote beautifully through the nineteenth century and into the early twentieth. But somewhere after that, coincident with the explosive growth of research, the art of writing science suffered a grave setback, and the stultifying convention descended that the best scientific prose should sound like a non-human author addressing a mechanical reader.²⁹⁶

Sadly, these words are yet truer today.

In the second place, we have been taught to regard ourselves as selfish, and the natural world out of which we emerge as essentially a field of ruthless competition. This has truth. But it is very much a half-truth. Its opposite is also true. We are moral beings, capable of selflessness, fulfilled through our interconnectedness with one another and the natural world at large. We are not atomistic. And the story of life on earth is not therefore one of competition only. It is at least as much, and arguably more, as I have already suggested, a story of co-operation and collaboration. In fact collaboration might be seen as, *sensu stricto*, ‘one of the central characteristics of life’.²⁹⁷

‘Complexity’, says Pross,

facilitates the replicative process ... in [a recent] experiment it was found that a single replicating RNA molecule was relatively ineffective at self-replication, but a pair of similar RNA molecules, neither self-replicating but each helping the other replicate, worked way better. Conceptually one can think of that step as the first on a thousand-mile journey toward that biological cell – a highly

complex cooperative entity, highly effective at making more of itself.²⁹⁸

Multicellular organisms appear to have arisen from single cells numerous times independently in the course of evolution.²⁹⁹ This alone implies that collaboration is a fundamental element in the evolution of life. According to Dupré and microbiologist colleague Maureen O'Malley, 'single animal or plant cells are only truly alive when they are collaborating with other cells ... in a great variety of ways.'³⁰⁰ Though it is part of our idea of living beings that they are autonomous entities, the very integrity of their function as a whole, on which such an idea of autonomy depends, *itself already* involves a host of other organisms.³⁰¹

This does not at all rule out competition: in fact the combination of competition and co-operation is just what collaboration means – and needs. As always, the forces for division must be balanced by those for union, and vice versa, though ultimately the two tendencies must be fruitfully unified, not divided. A collaborative team requires difference, not sameness, of types, strengths and roles; and every *society* – a form which life from its earliest origins approximates, even within the single cell – contains, and must contain in order to be healthy, elements of both difference and sameness. Communities of cells, according to Dupré and O'Malley,

exhibit well-defined cell organization and a functional division of labour that includes specialised cell-to-cell interactions, the suppression of cellular autonomy and competition, metabolic collaboration, combined defence and attack strategies, and the coordination of movement, growth and reproduction.³⁰²

And, as they go on to say,

whatever sense we might try to make of the Dawkinsian idea of selfish genes, molecular replication is always, and has always been from the pre-cellular molecular community to the present, the achievement of ensembles of molecules, not of individual molecules.³⁰³

And the entities that are seen to compete are already collaborations of ‘many different lineage-forming entities.’³⁰⁴

They see competition as a necessary stage in collaboration, ‘transitional’ rather than ‘terminal’:

temporarily competitive wholes will exhibit a strong tendency ultimately to compete most successfully by engaging in new levels of collaboration with similar or different entities ... our concept of collaboration assumes no sharp boundary between selfish and cooperative interactions, something surely to be expected *if the former is inclined to evolve into the latter*.³⁰⁵

I would also add here: on the whole, evolution has led to greater genuine collaboration, greater empathy, greater beauty and greater harmony. When reductionists want to demonstrate the brutality of nature, they are generally reduced – fittingly – to citing creatures such as the ichneumon wasp that lays its eggs in the larvae or pupae of another species, and the fascinating and, I agree troubling, lives of parasites (on which see Chapter 27). I don’t say that all is sweetness and light as we ascend the evolutionary tree, far from it: man, in particular, is a deeply flawed being – as well to remember that, when we pretend to be able to peer into the nature of the cosmos and find ready answers. But the very reason we are capable of deliberate harm is bound up with our special power to do deliberate good. (Social evolution, on the other hand, is another matter: I do not agree with Stephen Pinker that we are becoming better human beings. Though I fully understand his argument, I believe we are becoming less fully human, as we sacrifice what we could have learnt from attending to our right hemisphere’s understanding of the world.)

CONCLUSION

In the longer term many of our present assumptions about Nature, in both the broader and the more restricted sense of that term, may need to be revised, which is why at the largest possible scale it is still ultimately unpredictable: ‘Surprise is inherent in the structure of the world’, says Lee Smolin. ‘Nature can throw us surprises for which no amount of knowledge would have prepared us.’³⁰⁶ Jacob Bronowski once commented: ‘The physical scientists have more fun. Their theories are more eccentric; they live in a world in which the unexpected is everyday.’³⁰⁷ But *all* is unexpected if we could just see it. It’s just that physicists have learnt to expect the unexpected; many biologists are still in a preceding phase, in which the unexpected is dismissed, covered up, or simply not seen at all.

Things are changing, if slowly. Even one of the world’s most influential professors of mainstream bioengineering, Jay Keasling at Berkeley, together with three of his distinguished colleagues, wrote in a collaborative review published in the high-impact journal *Cell*:

An open question is whether biology is genuinely modular in an engineering sense or whether modularity is only a human construct that helps us understand biology ... In the context of biological engineering, it is still an open question whether abstraction is a useful tool or a necessary evil.³⁰⁸

It is both a useful tool, *and* it is an evil – how necessary depends on what you want science to do for you. Ultimately, it is not that the machine model does not have a role. There does not have to be just one model here. But, crucially, as in all hemispheric differences, one is more widely and fundamentally applicable than the other. Low-level analyses versus portrayal of the whole: it’s not an either-or matter, but if you want to *understand* the whole, it’s clear which is more important. Mechanism is a perfectly useful way of looking at tiny details in a complex picture so as to be in a position to manipulate them. There it has had spectacular successes. But we mustn’t be blinded by them. The problem is thinking that the same thinking will help you understand the whole: it can’t. ‘In its prime each

system is a triumphant success', wrote Whitehead: 'in its decay it is an obstructive nuisance. The transitions to new fruitfulness of understanding are achieved by recurrence to the utmost depths of intuition for the refreshment of imagination.'³⁰⁹ That is what we now need.

Haldane wryly noted of Pasteur that his work

appealed most strongly to those who desired to stress the contrast between mind and matter ... It is perhaps not quite irrelevant that he worked in his later years with half a brain. His right cerebral hemisphere had been extensively wrecked by the bursting of an artery when he was only forty-five years old; and the united brain power of the microbiologists who succeeded him has barely compensated for that accident.³¹⁰

Because *understanding* is more than providing a low-level description, the similarity to the understanding of a text is not accidental. To quote Lewontin again: 'An organism is less like a machine than it is like a language whose elements ... take unique meaning from their context'. Analyses of individual words and their possibilities of meaning can be an essential first step: without a knowledge of the words, we cannot grasp the whole. But at the same time, it is only the meaning of the whole that gives the individual words their full and proper significance. This, in a nutshell, is the truth that has for so long been ignored within biology.

As always, what the left hemisphere sees *must* serve the more inclusive vision of the right hemisphere, not come to dominate it. It makes an invaluable servant, but a tyrannical master. Failure to observe this principle leads to the neglect and obscuration of the most fundamental insights into the question posed by Plotinus, addressing which, according to Schrödinger, is the only justification for science: 'and we – who are we, anyway?'

INSTITUTIONAL SCIENCE AND TRUTH

Most human institutions, by the purely technical and professional manner in which they come to be administered, end by becoming obstacles to the very purposes which their founders had in view.

—William James ¹

Specialization is for insects.

—Robert Heinlein ²

SINCE SCIENCE, UNLIKE, SAY, REASON OR INTUITION, IS NOT JUST A FACULTY of mind, a way of approaching the world, but a vast edifice of human individuals working on projects, forging careers and shaping a culture, we need to look at the institution of science itself in order fully to assess science's claims on truth. For most people this is science's most evident manifestation, and one without the mediation of which they can have no knowledge of science, and therefore no access to whatever truth it may hold.

No-one these days is in a position to evaluate the validity of science's myriad pronouncements across more than the tiniest part of the whole range of what it treats. Even the most eminent scientist in his or her limited field, must rely, as we do, on authority, on the pronouncements of others. In fact every published paper is an instance of taking something on someone else's authority, on the understanding that peer review can vouch for its validity.

In answer to the all-important question at the core of this part of the book, ‘Where should we go for truth?’, the limitations imposed by the institution of science, are, whether we like it or not, almost as important as the limitations imposed by the nature of science itself. Whenever someone says ‘science teaches that ...’, they are relying, at best, on a broad knowledge of the published literature – most often not even that. Essentially, they are arguing from authority. So the question inevitably arises, how reliable is that authority?

The thrust of this chapter will be slightly different from the path we have been following, one which relates the hemisphere hypothesis to our approaches to truth. This chapter is necessary because science’s claims to truth cannot be assessed independently of an examination of the institutions of science; but I don’t wish to overstate the connexion with the hypothesis. There are indeed echoes, even resounding ones, and I shall point them out. But I think it is important that people should be aware of the degree to which the institution of science may fall short of the ideal in its pursuit of truth, without also having to be too concerned with the question of how much this can be attributed to the behaviour of our brain hemispheres. The phenomena are staring us in the face without the need of any hypothesis to illuminate them.

I imagine that most people who are not practising scientists have a view of how the institution of science operates that goes something like this. Research is carried out as a collective, collaborative enterprise in which everyone is disinterestedly doing his or her specialist bit in pursuit of the wider goal; bright young scientists are hired because they’re clever and original, then given their head, but supervised by wise professors who’ve been around, and whose broad grasp of the subject sensibly tempers their juniors’ lack of experience. Findings are published only after rigorous examination by peers, who act as objective arbiters of worth in their specialist area. Public science draws on such evidence in a balanced way to come up with policies promulgated to the population at large, based on a suitably extensive base of sound knowledge.

No doubt examples of such model scientific enterprise exist and we are all the beneficiaries of them. But the actual practice of science often falls far short of this and it is worth anatomising the various ways in which this happens, to the detriment of both science and truth, and of the public at large – that’s us all.

SPECIALISATION AND ITS IMPACT ON ORIGINAL THINKING

Science is the victim of its own extraordinary success. Such has been the exponential growth – the explosion – of scientific knowledge in the last three centuries, that all scientific enquiry has now to be highly specialist in nature. This means that many scientists are now so specialised that they often fail to understand the significance of anything outside their own narrow field, or how the work they do fits into the broader project of science as a whole, never mind into the field of philosophy and the humanities in general, and hence the lives of human beings – as Schrödinger saw that a scientist's work ultimately must, if it is to mean anything.

On this important matter it is worth quoting the historian and polymath Arnold Toynbee. He objected to what he called the importation of the 'bureaucratic state of mind', essentially the view of the left hemisphere, into the field of intellectual enquiry: he saw it as both out of place and obstructive, since 'in intellectual enquiry, freedom is the breath of life ... debate is the source of advances in knowledge and understanding, and ... the wider the field of discussion, the greater the chance of striking out fruitful new ideas.' He pleads for a demolition of the 'interdisciplinary dividing walls' to be replaced, in a striking image, by a structure

not like a Western house, but like a Japanese house, in which the internal arrangements can be given any number of alternative configurations, interchangeable at a moment's notice, because the interior is divided up by movable screens, not by walls that are 'permanent fixtures'.

He concludes, in an evocation of the necessary balance involved, that

This means that the panoramic and myopic approaches do not only benefit, both alike, by being made concurrently, but need each other's complementary services so much that no inquirer can afford to neglect either of them ... This, in turn, means that inquirers who

concentrate on the bird's-eye view and those who concentrate on the fly's-eye view are, not natural enemies but natural, and indeed indispensable, allies ...

Much as the right hemisphere understands the need for the left, but the left does not understand the need for the right, generalists appreciate the need for specialists, while the specialist is less able to see the need for the generalist. And Toynebee continues, later,

specialisation has become an indispensable intellectual tool. But being indispensable is not the same thing as being all-sufficient ... the farther that specialization is carried, the more of the meaning of the phenomena is left unplumbed in the unexplored gaps between the specialists' deep but narrowly constricted borings. This method leaves critical questions not only unanswered but unasked. And they will remain unasked if the microscopic approach is not supplemented by a panoramic one. Without a combination of the two, there can be no stereoscopic vision.³

This I believe goes to the nub of the matter: 'both/and', not 'either/or'. At present we have largely just one. We need to see with *both* eyes.

In an era where not just every organ, but every organelle, has its journal, and in which the jargon of each speciality becomes increasingly intimidating to outsiders, there is little incentive to look beyond the boundaries of your own ever narrower specialism. Indeed, the way to get on is to dig deeper in the hole you are already in, not to look around you to work out what all this spadework is about. For that way lies career death: you will cease to be an expert – one who has been defined as knowing more and more about less and less. As the physicist John Archibald Wheeler memorably observed, 'if you're working on something new, then you are necessarily an amateur.'⁴

Astronomer Jack Eddy reflected:

Entering a new field with a degree in another is not unlike Lewis and Clark walking into the camp of the Mandans. You are not one of them. They distrust you. Your degree means nothing and your name

is not recognized. You have to learn it all from scratch, earn their respect, and learn a lot on your own. But I also think that many of the most significant discoveries in science will be found not in but between the rigid boundaries of the disciplines: the terra incognita where much remains to be learned. It's not a place that's hidebound by practice and ritual. I have always tried to keep moving between fields of study...⁵

If perceiving shapes is how maths and science progress, as I believe it is, you will see those shapes only by rising above the hole where you are digging. The view in the valley floor is good, but if you never climb, you will not know that there are many other valleys, and mountain ranges nearby, which are not only beautiful in themselves, but help you see *why* good work needs to be done down in the valley floor at all. To quote Smolin, science gets reduced to technical problem-solving, and 'it is a fantasy to imagine that foundational problems can be solved by technical problem-solving within existing theories'.⁶

'General ideas, hypotheses, are necessary in science itself', wrote the philosopher John Dewey:

They serve an indispensable purpose. They open new points of view; they liberate us from the bondage of habit which is always closing in on us, restricting our vision both of what is and of what the actual may become. They direct operations that reveal new truths and new possibilities. They enable us to escape from the pressure of immediate circumstance and provincial boundaries. Knowledge falters when imagination clips its wings or fears to use them. Every great advance in science has issued from a new audacity of imagination.⁷

For those who would rather hear a scientist on science than a philosopher, here is the palaeontologist George Gaylord Simpson:

Science, truly to be such, must centre not on descriptions and names but on principles – that is, generalizations, theories, relationships, interconnections, explanations about and among the facts.⁸

Science can never be merely the extension of technique, as it often now seems to be. Knowing how to do something is not the same as understanding it; expanding know-how, our power to control, exponentially, without any concomitant advance in wisdom, is dangerous. It's like putting machine guns in the hands of toddlers. In 1991 Jonas Salk, who developed the polio vaccine, said: 'At one time we had wisdom, but little knowledge. Now we have a great deal of knowledge, but do we have enough wisdom to deal with that knowledge?'⁹

I have mentioned Erwin Chargaff before. He was a distinguished professor of biochemistry at Columbia. His researches, which he freely shared with Crick and Watson, led to what are known as Chargaff's rules, which made the discovery of the structure of DNA possible. He noted how extraordinarily different the world of science had become during his lifetime:

The world of science was open before us to a degree that has become inconceivable now, when pages and pages of application papers must justify the plan of investigating, 'in depth', the thirty-fifth foot of the centipede; and one is judged by a jury of one's peers who are all centipedists or molecular podiatrists. I would say that most of the great scientists of the past could not have arisen, that, in fact, most sciences could not have been founded, if the present utility-drunk and goal-directed attitude had prevailed. ¹⁰

He writes of a real fear that seems to me well-grounded: that there is no vision of what we are doing in science, and that, most worryingly, our inevitable ignorance of all but a small part has been forgotten. He relates this to changes in the way we think: from a broad, creative process in which the open pursuit of knowledge for its own sake was valued, to the narrow, deterministic, 'utility-drunk' and 'goal-directed' attitude of the left hemisphere mindset. In Carse's terms what should be an infinite game, has become a finite one. Chargaff likens the effect to the piecemeal destruction of a great work of art:

The wonderful, inconceivably intricate tapestry is being taken apart strand by strand; each thread is being pulled out, torn up, and

analysed; and at the end even the memory of the design is lost and can no longer be recalled.¹¹

He continues that there has been

an outright change in the types of individuals entering the various disciplines. Science has become a hard and pitiless and, what is even worse, a thoroughly humourless master ... The profound Lichtenberg [the eighteenth-century German physicist and philosopher] had taught me that for people to find something they must first know that it exists. This was an assurance that I have never lacked during my entire life. What became weaker as I grew older was the conviction that the way of searching which we had chosen was the right one. The feeling that there is always more than he can find, that he is only pulling shreds out of an unfathomable continuum, forms part of my definition of a scientist. ¹²

He comments that in the world in which young people now have to learn science, keeping in with one's boss and following fashion are so important that 'a few of these young people may, in the course of their apprenticeship, become scientists, but most never will. They will turn into specialists.'¹³ And, he observes, specialism drives the scientific disciplines further and further apart, as well as leading to 'an enormous rise in the costs required to maintain and expand the scientific establishment, with a concomitantly increasing gap between claims and achievement.'¹⁴

Chargaff lamented what he called the 'overfragmentation of the vision of nature – or actually its complete disappearance among the majority of scientists'. In its place was

a Humpty-Dumpty world that must become increasingly unmanageable as more and tinier pieces are broken off, 'for closer inspection', from the continuum of nature.¹⁵

It is salutary to remember that much great science of the past was done by people who were broad-ranging thinkers, often working alone, and often

outside the walls of any academic institution. Even into the modern era, three of its intellectual giants, whose influence ranges well outside of any speciality – Darwin, Freud and Einstein – did the work for which they are mainly remembered alone, and often without the support (or the straitjacket, depending on how you look at it) of conventional academic institutions.

It is worth noting also that, like other intellectual giants such as Russell, Whitehead and Wittgenstein, much (indeed, with the exception of Einstein, almost all) of their influence comes, not through papers, but through lectures or books. A book gives time and space for ideas to be properly developed. The scientific paper, in particular the conventional contemporary science paper, is best suited to the dissemination of data, rather less well to the exposition of seminal ideas, though it does happen. Nowadays career scientists don't write books. Books have no career value, because they have no 'impact factor' associated with them, and they take (or should take) a long time to write, time which could be more usefully applied to producing papers. The parts are more valuable than the whole: salami slicing rules. What counts, as usual, doesn't get counted.

Furthermore, books are also likely to be addressed to the 'laity', which as I say turns out to be anyone – even another scientist – not specialising in whatever area is under discussion: and 'how can *they* be expected to understand real science'? My worry is that even the descriptions of human behaviour on which neurology, psychiatry and psychology depend are becoming further and further from any experience of a human being, and as a result further and further from the purview of an intelligent non-specialist reader. As the reader of Part I will know, the in-depth case studies of the early twentieth-century German and French literature, particularly, provide fascinating insights into human experience that leap from the page – treasure troves of, at the same time, both detailed information and a broad human understanding. Even research papers written in the 1970s and '80s, and well into the 1990s, seem for the most part, to be written for a human being, and understandable by any intelligent reader with a basic science background. At some point in the last 20–30 years, however, that sense has been lost. The terminology is a significant part of the problem. All human description but the most limited kind is excluded: subjects are selected by the application of a 'tool', the 'cohort' is put through a scanner, and the data then submitted to computer analysis, the technical data on this replacing any account of human behaviour or experience. Increasingly, the heavily

acronymic jargon of research papers seems to me to present an almost impenetrable barrier to anyone other than the most highly specialised reader, and even then, if they are to get anything out of the exercise, they must have a huge capacity to tolerate boredom.

An analysis of the language of research publications over time confirms my impression that there is what the author calls a ‘drift towards inaccessibility’ that took off in the last decades of the twentieth century:

The broad consequences are that ideas flow less freely across and within the sciences, and the public’s access to (and maybe trust in) science is diminished ... To scientists this trend represents a narrowing of their range of expertise, even while the depth of their knowledge grows. So they may change specialities less often as the costs of becoming expert in another area grow ... This erection of higher and higher barriers to the comprehension of scientific affairs must surely diminish science itself. Above all, it is a threat to an essential characteristic of the endeavour – its openness to outside examination and appraisal.¹⁶

And that was just in 1992, some 30 years ago.

Of course I am particularly concerned with neuroscience; and it is a problem that today’s neuroscientists and psychologists are themselves increasingly focussed on mechanisms and increasingly unused to seeing what they do as having much to do with *persons*. Yet, if you stop thinking of the brain as just a mechanism, it becomes possible, once more, to see it for what it most assuredly is: part of a person. In an era that, at least in name, embraces embodied philosophy, that should be a very important step. In the film *The Divided Brain*, Michael Gazzaniga says of *The Master and his Emissary*: ‘This book is taking a selected set of neuroscience findings and trying to relate them to the clinical psychiatric experience, telling us a story that tries to mesh those two things. I’m not comfortable with that.’ What is implied by the word ‘selected’ is another matter (there are over 2,000 findings referred to). But what is surely fascinating is that a prominent research psychologist, working on how the brain functions in a lab, should not be comfortable with relating brain research to actual *people* with brain conditions outside the lab: what he calls ‘clinical psychiatric experience’. Such research is *ipso facto* ‘related’ to real people. I had,

further, assumed the point of such research was to apply it to their benefit, if not at least to help us understand Plotinus's question, 'who are we?' Or as the great neurosurgeon Wilder Penfield put it: 'The problem of neurology is to understand man himself.' Gazzaniga continues: 'I think here's how you think about it. The brain is as mechanical as clockwork ... Let's just get over that – that's the way it is.'¹⁷

I am reminded of the words of Jonas Salk, when asked about how brain science can help us understand the world and lead better lives: 'It's in the human dimension, as distinct from the molecular-cellular, if I could make this contrast, trying to understand the whole, which is far greater than the sum of the parts. That is where I sense the need for a new kind of mind, for individuals who are integrators, as distinct from the reductionists, or reductionists who could integrate as well.'¹⁸

One sees many factors here that do indeed align with the hemisphere hypothesis: narrowness, technicalisation and fragmentation, at the expense of breadth, humanity and synthesis; the familiar at the expense of the original; a suspicion of all forms of judgment based on quality, and their replacement by those based on quantity; and we will see more as we go on.

Unfortunately, many scientists are not comfortable with philosophy. They see it as an area in which they cannot have precise answers and access to the 'truth'. That there could be a place where they might have certainty is, of course, an illusion, as I have emphasised. And not only can science not divorce itself from philosophy, but it doesn't get closer to the truth by the attempt. Quite the reverse.

It is all too understandable that scientists don't want to think philosophically about what their research tells us. But they can't avoid it. And because they can't avoid it, but too often don't think about it, they impose a default, naïve form of materialism on anyone who will listen. It seems to be assumed that, just because someone is a good astrophysicist or evolutionary biologist, that fact in itself qualifies him or her to lay down the law on subjects such as the existence or otherwise of a God. 'Now that science has most successfully resisted theology', wrote Nietzsche,

whose 'hand maid' it was for too long, it is now, with great high spirits and a plentiful lack of understanding, taking it upon itself to lay down laws for philosophy, and for once to play the 'master' – what am I saying? to play the *philosopher* itself.¹⁹

HOW RELIABLE IS SCIENTIFIC EVIDENCE?

Good scientists themselves do not make the sorts of claims for certainty that are sometimes made on their behalf.

Preliminary remarks on neuroimaging

Clearly the argument of this book depends on research into the brain: increasingly brain research relies on forms of functional neuroimaging, from which much useful information can be gathered. As one might expect, it has its strengths and weaknesses. Since knowing how it can inform and how it can obfuscate is central to the way we should evaluate it, I cannot avoid some brief preliminary remarks on the topic. Then I will turn to the issue of reliability more generally in science.

Scanning generates hugely complex data sets. There are understandable problems involved in the interpretation of such data sets by software packages. It was suggested in a much publicised paper in 2016 that ‘a bug in software’ might have invalidated 15 years of fMRI (functional magnetic resonance imaging) research.²⁰ The point at issue was that such packages carry out over 100,000 independent statistical tests on the results, inflating the number of false positive results. That is to say, if you do enough comparisons, you will find some that come up trumps by chance alone.

However, the suggestion that this problem goes mainly uncorrected is not accurate. Certainly one published rebuttal suggests that the claim is based on an erroneous conclusion about the resting state with which results are conventionally compared, and provides ‘no basis to question the validity of the thousands of published fMRI studies that have corrected for multiple comparisons or the commonly employed methods to correct for multiple comparisons’.²¹

Whether that is where the matter rests, or not – and I suspect it is not the end of the story – only time, and the debate of expert statisticians, will decide. The point I am making is that, in a healthy science, such debate is intrinsic to the process of science; and which are the correct inferences to draw from complex computer-generated data sets is not above such debate.

Structural imaging of the brain is more or less unimpeachable: it effectively enables one to conduct a living post-mortem. Though what to make of one's findings may be problematic (an abnormally enlarged region may be as dysfunctional as one that is abnormally reduced in size, for example), what one is seeing is not. As a research tool, *functional* imaging, however, is fraught with difficulties; and wherever there is another source of information about brain function, functional scanning should be treated in concert with it, as providing, at best, confirmation. And when it is in conflict with other sources of information, we should be appropriately circumspect. This is because interpretation of such data is peculiarly uncertain, for a number of reasons.

Experimental science often takes not just data and ideas out of context, but takes people out of one context and puts them in another. Many lab situations are extremely unusual contexts from which to generalise. Lying in a scanner is one of them. 'It is known that changes in experimental conditions can lead to large changes in the patterns of regional metabolic activity', writes Bruce Wexler, a proponent of positron emission tomography (PET), a type of functional metabolic imaging; adding that 'with this in mind I must note that special and unusual conditions are unavoidable concomitants of all PET studies.' Small variations in the way the task is presented may make a large difference to the results. Changes in novelty or complexity can mask relevant structures – or falsely identify irrelevant ones.²² Subtraction paradigms, where two sets of conditions are compared so as to isolate the element of interest, are associated with their own problems.²³

And there's more. Functional imaging is deceptively attractive because it appears to localise: that is much of its appeal. But for a number of reasons outlined earlier [*schizophrenia and autism ch – search Monakow*], the brain does not function in local modules but in widely distributed networks. An area that 'lights up' hides as much as it reveals. In Elkhonon Goldberg's phrase,

trying to surmise the brain activation pattern of a cognitive task based on functional neuroimaging data may be like Noah trying to surmise the landscape of Mesopotamia after the Great Flood by staring at the peak of Mount Ararat protruding above the water.²⁴

One cannot assume that the areas that ‘light up’ are those fundamentally responsible for the ‘function’ being imaged, or that areas that do not ‘light up’ are not involved.²⁵ Areas that show activity may be doing so in *response* to activity somewhere else in the brain which is not showing up, but is the primary link with the activity in which we are interested. Metabolic activity may be great in one part of the system, eg, in the basal ganglia, because this is a regulatory constituent of a system whose other parts (neocortex) are where the activity we are interested in measuring is probably best understood as ‘going on’. Wexler continues that ‘the assumption is that areas with increased or decreased metabolic activity are in some ways dysfunctional (areas with normal metabolic rates might also be dysfunctional)’:

These uncertainties can be illustrated by analogy with the fuel consumption and electrical activity in an automobile. In a car a variety of functional changes can result in similar levels of fuel consumption. A total lack of fuel use is consistent with mechanical failure, but could also result from a sick or vacationing driver who never starts the car. Increased fuel consumption could be found in a high-performance sports car, a poorly tuned old clunker, or an ordinary car moving at normal speed with an emergency brake on. A change in electrical patterns could be due to the use of windshield wipers or defrosters, the activation by loss of oil of an indicator light, or use of the audio system.²⁶

Imaging has become more sophisticated since this was written, but most of these considerations are still as applicable, since data still require *interpretation*: it can’t just be ‘read off’ in some assumed to be objective, and therefore truthful, fashion.

A further complication is that only effortful tasks tend to register: this means that the more expert we are at something, the *less* we will see brain activity. An expert will show lower levels of activation than someone unfamiliar with the task: equally a part of the brain that is normally not particularly significant in a certain task may show up as ‘highly active’ if, for reasons of experimental design or brain abnormality, it ends up inexpertly dealing with it. In keeping with this, people with higher IQs have

lower cerebral metabolic rates during mentally active conditions;²⁷ as do those with bigger brain size,²⁸ which is also correlated with IQ.²⁹ If you allow yourself to take in the full import of this principle, a degree of hesitancy should encumber naïve enthusiasm.

We have, too, to remember that the activations we visualise in the brain may actually be inhibitory in nature – inhibition may be indistinguishable from activation using current fMRI methods.³⁰ That's a pretty important distinction when it comes to interpreting what you see: especially in the human brain, where, as we saw in Chapter 1, so much activity is inhibitory.

As if that is not enough, many variables are involved in any experiment involving human beings. Male and female subjects respond differently – so differently, in terms of laterality, as we have seen, that it may destroy the validity of findings by suggesting a null result where the reality is that there are significant, but opposite, lateralising tendencies between sexes which, once aggregated, cancel one another out.³¹ Not only left- and right-handedness may make a difference, but more importantly, strongly lateralised handedness (whether right or left) may give a quite different picture from more mixed handedness; race and age also make differences. Individual cases may be different because the way we experience the world individually is different; even the same brain varies in its response to the same task depending on the context – for example, what's happened previously.

The upshot of all this is that many studies lack statistical power to reach the conclusions they would like to claim. This is of especial relevance to *brain laterality*. On top of the problems already mentioned, according to Nikki Marinsek and colleagues,

neuroimaging studies may especially fail to shed light on hemispheric lateralization: contrasts designed to find the neural correlates of one process may be contaminated by the neural fingerprints of another, which may in turn make a truly lateralized process appear bilateral. We also necessarily make the neuroimager's fallacy in almost every case, as the vast majority of studies – even those that report lateralization results – only report clusters of activation, not direct contrasts across hemispheres.³²

In any case, activity in both hemispheres doesn't make the contribution equal. It depends what the activation signifies. Whenever you start a car engine, the fan comes on, but it doesn't propel the car.

Scanners require task simplification, and the more the task is simplified, the less it is like anything that happens in the real world. Yet the more complex the task, the more widely distributed the networks involved are likely to be, and the harder it will be to know what it is that one is measuring, and how it correlates to any one human activity. And broader activation brings a further problem. If one hemisphere makes a limited contribution to a process, but shows a single persistently activated area throughout a scan, it will falsely appear much more strongly correlated with the activity than the other hemisphere, in which, though the involvement covers a much larger area, the focus of maximum activity continually varies. No one focus in this hemisphere will seem as correlated with the activity in question as a much less significant (but confined and persistent) focus appearing in the other hemisphere. This is especially true where the results from numerous studies are aggregated in an attempt to locate the 'key' area.³³

Hence the vitally illuminating power of deficit literature – studies of those who have an acute loss of one hemisphere's input to a process, through stroke, injury or tumour – to reveal the individual contribution of one brain region at a time. Such studies tend to be more consistent, as you might imagine, than neuroimaging literature.³⁴ They have their problems, too, and they cannot avoid some of the same issues that bedevil the imaging literature; but almost all the drawbacks to lesion studies tend in the direction of false negatives – missing something that is there – not false positives – finding something that isn't; so that when you find a clear result, repeatedly, it is relatively reliable. And it is now possible experimentally to suppress for a while a particular hemisphere or part of a hemisphere, and observe what happens to the person whose brain it is. It is true that Hughlings Jackson warned that 'to locate the damage which destroys speech and to locate speech are two different things'.³⁵ But there were no scans in his era, and this criticism of simple mapping applies, *mutatis mutandis*, to all localisation techniques, most particularly to functional imaging: seeing a spot on a scan 'light up' when you speak is, also, not to locate speech. As Justine Sergent cautioned, the benefits of functional neuroimaging 'should not mask its inherent limitations nor the risk of

promoting a modern type of phrenology that would disregard evidence of interactive and distributed processing carried out in cerebral structures'.³⁶

The long and short is that lesion studies are a vital ingredient in a mix which includes imaging studies and EEG studies of normal brains, and a combination of approaches is best.³⁷ To quote one prominent neuroimaging specialist: 'Some people believe that psychology is just being replaced by brain imaging, but I don't think that's the case at all ... It's the confrontation of all these different methods that creates knowledge.'³⁸

Replication of results

Now to turn to more general considerations applicable to science research across the board. A large collaborative study published in *Science* in 2015 found that repeating experiments in psychology produced significant results in only half of cases, with the combined results yielding a significance rate of 68%, down from 97%.³⁹ Given how complex and variable human beings are, this is not too surprising, but it is worth bearing in mind. The study concluded that results were generally unreliable, because not easily reproducible. However, a subsequent response in *Science* claimed that this paper itself contained three statistical errors, and that it 'provides no support for such a conclusion ... the data are consistent with the opposite conclusion, namely, that the reproducibility of psychological science is quite high'.⁴⁰ To which the original research team responded by suggesting that 'both optimistic and pessimistic conclusions about reproducibility are possible, and neither are warranted'.⁴¹

You might be forgiven for thinking that this result illustrates the difficulty of measurement specifically in psychology. But that is not the case. Two of the best-known analyses, from psychology⁴² and cancer biology,⁴³ found reproducibility rates of around 40% and 10%, respectively. A survey of 1,576 researchers across scientific disciplines published in *Nature* revealed that more than 70% of researchers had tried and failed to reproduce another scientist's experiments, and more than half had failed to reproduce their own experiment.⁴⁴ In fact, more than half thought there was a significant crisis in research reproducibility and only 3% thought there wasn't a crisis at all. Yet 73% nonetheless went on to say that they thought that at least half of the papers in their field could be trusted, with physicists

and chemists generally showing the most confidence. And although the vast majority of respondents had failed to reproduce an experiment, less than 20% said that they had ever been contacted by another researcher unable to reproduce their work. The results of this study were ‘strikingly similar’ to another online survey of nearly 900 members of the American Society for Cell Biology.⁴⁵

Take something about as far removed as can be from human biology – the measurement of fundamental physical constants, such as the speed of light (c), the Planck constant (h), and the gravitational constant (G). According to Henrion & Fischhoff,

assessing the uncertainty due to possible systematic errors in a physical measurement unavoidably involves an element of subjective judgment. Examination of historical measurements and recommended values for the fundamental physical constants shows that the reported uncertainties have a consistent bias towards underestimating the actual errors. These findings are comparable to findings of persistent overconfidence in psychological research on the assessment of subjective probability distributions.

They conclude: ‘The underestimation of uncertainty in measurement of physical constants and compilations of recommended values seems to be pervasive.’⁴⁶

One might assume that, while replication was an issue across the board, it was much less likely to affect widely cited work published in the more prestigious journals. But is that a valid assumption?

A problem for the general public is that the heavy-hitting articles with catchy titles make headlines in the popular press, while the more measured responses, that create a more nuanced picture, do not. So the public is served up two competing fantasies: that anything that comes from science is irreproachable, and that most of it is irredeemably flawed. This kind of polarisation makes rational debate about the true (therefore limited) value of science very difficult indeed.

Marcus Munafò, a biological psychologist, and Jonathan Flint, a prominent geneticist, warn that genetic ‘breakthroughs’ in medicine are often nothing of the sort. The discovery of genes for depression or

schizophrenia – or for happiness – get good press coverage, usually based on publication in a respected scientific journal such as *Science* or *Nature*. Less prestigious journals often subsequently publish reports that contradict the original claim, some suggesting that the findings are quite compatible with chance. These reports, usually with larger samples, are rarely newsworthy.⁴⁷ On the face of it unexpectedly, the authors found that studies published in journals such as *Nature* or *Science* with a high ‘impact factor’ (IF), a measure of the frequency with which the average paper in a journal is cited in a year (typically taken to indicate higher prestige or quality), are less likely to give an accurate estimate of effect size than those published in journals with a lower impact factor.⁴⁸

To the credit of science, one of the most cited papers in the last decade of science publishing is by a professor of medicine and statistics at Stanford called John Ioannidis.⁴⁹ Its title, ‘Why most published research findings are false’, gives an inkling of its conclusion. Its point is that much – apparently most – research is not adequately designed to prove what it claims to show. Many studies in the area of neuroscience, for example, will miss genuine effects, and ‘find’ false effects, because of low statistical power. This is partly a result of the huge expense involved in carrying out scanning studies on a large scale.⁵⁰ Yet, of course, spending less (but a still not inconsiderable amount) on producing invalid data is a waste of time, money and human effort.

Ioannidis casts light on the see-sawing of research findings that we have observed. ‘The hotter a scientific field (with more scientific teams involved), the less likely the research findings are to be true’, he warns:

With many teams working on the same field and with massive experimental data being produced, timing is of the essence in beating competition. Thus, each team may prioritise pursuing and disseminating its most impressive ‘positive’ results. ‘Negative’ results may become attractive for dissemination only if some other team has found a ‘positive’ association on the same question. In that case, it may be attractive to refute a claim made in some prestigious journal. The term Proteus phenomenon has been coined [by Ioannidis himself] to describe this phenomenon of rapidly

alternating extreme research claims and extremely opposite refutations.⁵¹

Ioannidis continues, with a further point that is ethically more troubling, but will hardly surprise anyone who understands human nature: ‘the greater the financial and other interests and prejudices in a scientific field the less likely the research findings are to be true’. He continues:

Many otherwise seemingly independent, university-based studies may be conducted for no other reason than to give physicians and researchers qualifications for promotion or tenure. Such non-financial conflicts may also lead to distorted reported results and interpretations.⁵²

Publication in a learned journal brings a huge temptation. Those who have published breakthrough results in prestigious journals get offered extremely attractive packages at major universities. This process has ‘cut a swathe through scientific thinking like a forest fire, turning our thoughts and efforts away from scientific problems and solutions, and towards the process of submission, reviewing and publication.’⁵³ In order to achieve this desirable outcome, researchers may keep analysing the results in slightly different ways (known as ‘data mining’) until they get a significant *p*-value (a measure of statistical significance, conventionally less than 0.05). This makes one’s research much more likely to be published.

Though this is misleading, it is more what would normally be considered a misdemeanour than actual fraud. Yet its cumulative impact may be great. In a survey of 3,200 scientists, 33% said they had engaged in at least one of the 10 most common research ‘misdemeanours’ during the previous three years.⁵⁴ Since this finding is based on a questionnaire survey, with a response rate of about 45%, the figure may be a serious underestimate, since more corrupt scientists are less likely to participate in a survey of this kind. Another study which involved inducements to be honest, found that ‘even raw self-admission rates [frank admissions of guilt] were surprisingly high, and for certain practices, the inferred actual estimates approached 100%, which suggests that these practices may constitute the *de facto* scientific norm’.⁵⁵ Ginny Barbour, a senior editor

with the *PLoS* group of journals, reports that one-third of authors could not find the original data to back up figures in scientific papers when these were questioned.⁵⁶

Turning to recognisable fraud, in 2012, the *BMJ* reported that a survey of more than 2,700 researchers showed that

one in seven UK-based scientists or doctors has witnessed colleagues intentionally altering or fabricating data during their research for the purposes of publication ... 13% of these researchers admitted knowledge of colleagues 'inappropriately adjusting, excluding, altering, or fabricating data' for the purpose of publication ... The *BMJ* has been told of junior academics being advised to keep concerns to themselves to protect their careers, being bullied into not publishing their findings, or having their contracts terminated when they spoke out.⁵⁷

THE PROBLEMS OF PUBLICATION

The pressure to publish or perish, typical of a world in which quantity is more important than quality, and where, if it can't be measured, it isn't real, means that universities insist that their academic staff produce papers, whether or not they have anything to say. This process is inimical to free thinking, a topic to which I will return. Scientific *thinking* gets crystallised too early, before it has had a chance to broaden and deepen; there is no longer a chance for ideas to evolve, to enter the necessary fallow period of unconscious gestation, without being prematurely forced into explicit form, and worse still in sliced form, so that what might have come to be a dawning new *Gestalt* is forever lost. And in the end, science is not about producing data so much as *thinking*, to which the acquisition of data can be only a prelude or addendum. This seems sometimes to be forgotten.

But the pressure also skews science badly. Positive findings are considered more prestigious than negative ones, which are, however, equally valuable and equally significant. It is much harder to get negative outcomes – such as finding that a medical intervention does not work – published (unless it is a non-mainstream intervention). Richard Smith, former editor of the *BMJ*, claims that as a result it is 'clear that authors often do not even bother to write up such studies. This matters because it biases the information base of medicine.'⁵⁸ In 1998 a review of trials published in England found that only one in four did not give positive results. More troublingly, not a single trial published in China or Russia (and across the former USSR) found a test treatment to be ineffective.⁵⁹

Pressure results in corners being cut, and claims being inflated. According to Cambridge biologist Peter Lawrence, what you need to do in order to succeed is

hype your work, slice the findings up as much as possible (four papers good, two papers bad), compress the results (most top journals have little space, a typical *Nature* letter now has the density of a black hole), simplify your conclusions but complexify the material (more difficult for reviewers to fault it!) ...⁶⁰

The result is the usual effect of hypertrophic growth: it becomes harder and harder to cut a path through the tediously luxuriant thicket of science publishing to find the clearing where truly excellent, thoughtful science resides.

The way in which research is now evaluated corrupts the data and is a fertile source of confusion on its own. It is also incidentally just another example of how when we try to introduce ‘objective’ measuring systems, we often make things worse than allowing people to use their judgment. The impact factor has become an omnipresent distorting factor. As we have seen, journals with higher IF have been found to be less reliable than some of those with a lower IF. But that’s just the beginning. If a journal publishes few articles, but one of those gets to be cited many times, the IF is immediately raised.⁶¹ The process is inevitably open to corruption. For example, a journal could commission a literature review on a topic that was dealt with by an earlier publication or publications in the same journal. This would result in its articles being repeatedly cited, with the result that its IF is artificially inflated.⁶²

According to Peter Lawrence, ‘the use of both the H-index [an alternative to IF] and impact factors to evaluate scientists has increased unethical behaviour: it rewards those who gate-crash their names on to author lists.’ Being a name on a paper does not require that you are more than dimly aware of the research. This has the advantage that when a paper is heavily criticised you can claim distance, something that, as Lawrence tartly points out, has never been pleaded when it is time to dish out the prizes.⁶³

The IF also exerts a baleful influence on journal content in other ways. Case reports, which were once the lifeblood of medical journals, are seldom published these days, except as occasional letters. The point is that case reports, by their nature, deal with rare events, which means they are less likely to be cited than other types of article, and so, it is feared, will drag down the IF.⁶⁴ This leads to a huge impoverishment in the field of medicine, as one can easily discover by going back into the beautifully detailed journal reports of an earlier era, and comparing them with the thin aggregated data from subjects who have been selected by an assessment tool, put through a scanner, and then subjected to an array of statistical tests. Note, though, that – yet again – this is not an ‘either/or’ matter. We need

both kinds of study, not just one. At the moment the former kind is an endangered species.

The primary purpose of the IF may be to rank journals, but it is now often used as a proxy measure to evaluate the quality of individual researchers. This is bad enough, but remember it is not even the impact factor of the researcher's paper that is counted, but that of the journal in which it was published. The actual paper may prove to have been a waste of many people's time, but it will still count favourably towards getting the next job. The need to publish in high-IF journals may force researchers to do their work in already 'highly populated' areas of science, as there is a readily available, large cohort of fellow researchers in the same field, who could potentially cite each other's works (even if only negatively), as has been recently pointed out.⁶⁵ To coin a phrase, in science there is only one thing worse than being talked about, and that is not being talked about.

But being cited doesn't mean being read. The pressure to produce paper after paper means that other papers are often cited without the citation even being verified, never mind the paper, or even the abstract, read. Occasionally, as I have discovered after looking it up, the main finding of a cited paper was the precise opposite of the one it has been repeatedly cited in the literature as offering. Peter Lawrence estimates that of the 48 citations of one of his papers, only eight were appropriate, 37 being irrelevant and three plain wrong.⁶⁶ It is estimated that only 20% of cited papers have actually been read, where the word 'read' means 'at the very least consulted a trusted source (eg, the original paper or heavily-used and authenticated databases) in putting together the citation list.'⁶⁷ (For the record, I did read the paper: I even went so far – my preferred method – as to read it in the more conventional sense, though I cannot claim to have understood all the statistical formulae.) The authors of the paper looked at propagation of misprints by blind copying, and found one misprint that 'propagated' in the literature 78 times. I have found numerous others, which are occasionally adverted to in the notes throughout this book.

And sometimes it's not even a matter of laziness – more like desperation. With disarming honesty, one of the authors of a paper on melanism in fish included the remark, 'Should we cite the crappy Gabor paper here?', a comment which slipped undetected into the published article.⁶⁸

A whole new level of unreliability has been reached through a process whereby authors pay to have their work published. This is well-intentioned, in that it puts the burden on (the institution of) the researcher rather than the reader, enabling the journal to become ‘open access’. But since publishing a paper makes money for the journal, whereas declining it neglects an opportunity, it is clearly open to corruption. Some journals take papers for no better reason than because the authors pay to have them published: in China it is even possible to arrange to have your name put on someone else’s paper, or to have prestigious authors attached to your own, for a fee.⁶⁹

In 2014, Peter Vamplew, an Australian computer scientist, submitted a paper to the *International Journal of Advanced Computer Technology* after receiving dozens of unsolicited emails from the publication, and from other journals of dubious moral standards. The paper, entitled ‘Get Me Off Your Fucking Mailing List’, consisted simply of the seven words of the title repeated over and over again for several pages. Nothing else. He even added a helpful diagram:

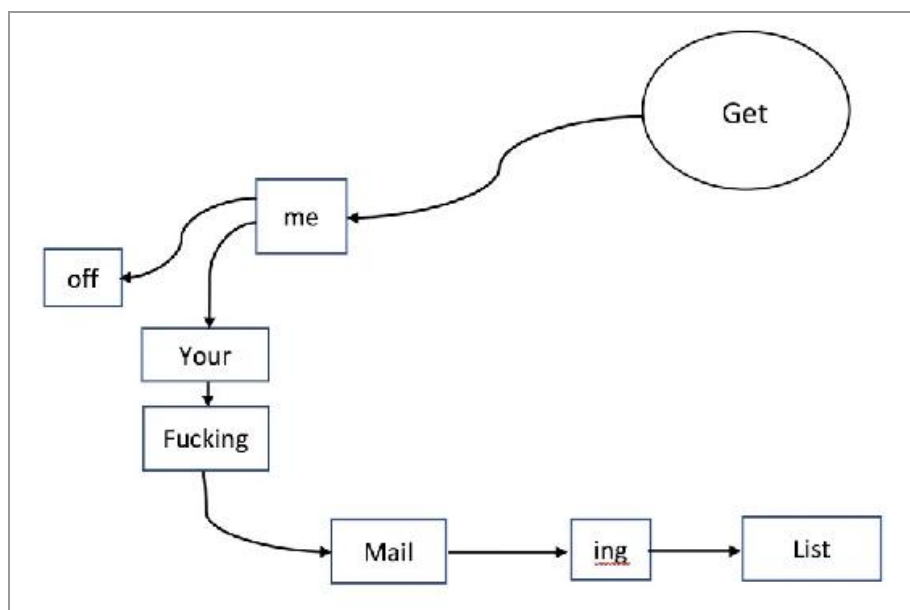


Fig. 33. ‘Flow diagram’ from spoof paper sent to International Journal of Advanced Computer Technology by Peter Vamplew, 2014

He expected that the journal’s editors would ‘read it, ignore it, and at best take me off their mailing list’. Weeks later, he received good news. It

was accepted for publication: ‘I pretty much fell off my chair.’ In line with the highest academic standards, ‘Get Me Off Your Fucking Mailing List’ had reportedly been subjected to rigorous, anonymous peer review. ‘They told me to add some more recent references and do a bit of reformatting’, he said. ‘But otherwise they said its suitability for the journal was excellent.’ Vamplew was required to pay a \$150 fee to have the paper published, but he declined. The scheme earned Vamplew some online recognition, but at the time of reporting, his main aim remained unfulfilled. ‘They still haven’t taken me off their mailing list’, he said.⁷⁰

An academic librarian at the University of Colorado, Jeffrey Beall, reported in *Nature* that up to 10% of open-access journals were exploiting the model by charging a fee to proofread, peer-review and edit a research paper without actually carrying out the work. His blog, entitled Scholarly Open Access, listed questionable, scholarly open-access publishers, that showed signs of being unethical or even predatory. By the time it closed down, it listed 1,155 publishing houses, with respectable-sounding names such as ‘Academic Research Journals’, ‘Scientific & Academic Publishing’, ‘Science and Education’, ‘Open Science Publications’, ‘International Science & Research Journals’, ‘Global Scientific Research Journals’, ‘Frontiers in Bioscience’ and ‘Advancements in Science’. On 15 January 2017, however, his blog was suddenly wiped clean and subsequently closed down. Initially he refused to say anything about the reason, but, according to the *Nature* blog,⁷¹ he later referred, in a piece for *Biomedica Medica*, to ‘threats and politics’. That piece makes gripping reading, and every reader of this book is recommended to read it in full.⁷² Arguing that ‘predatory publishers pose the biggest threat to science since the Inquisition’, and that ‘the once-proud scholarly publishing industry is in a state of rapid decline’, he attacks those at the heart of academe who connive at the destruction of scientific integrity:

facing intense pressure from my employer, the University of Colorado Denver, and fearing for my job, I shut down the blog ... I think that since the advent of predatory publishing, there have been tens of thousands of researchers who have earned Masters and PhD degrees, been awarded other credentials and certifications, received tenure and promotion, and gotten employment – that they otherwise would not have been able to achieve – all because of the easy article

acceptance that the pay-to-publish journals offer ... Universities in the United States are far along in the process of corporatizing themselves, and, in doing so, their public relations departments prefer that all university output be positive and aimed at attracting new customers, tuition-paying students. So if you are a faculty member at a university and you publish a blacklist, you will likely face much opposition and even harassment from the university, despite assurances of academic freedom ... Over the five years I tracked and listed predatory publishers and journals, those who attacked me the most were other academic librarians. The attacks were often personal and unrelated to the ideas I was sharing or to the discoveries I was making about predatory publishers ... Librarianship slavishly follows political correctness and trendiness ...

Beall's list importantly remains, at the time of writing, archived on the web.⁷³ That it is no longer live, however, means that publishers have no opportunity or incentive to improve their track record in order to get their name removed, and new journals can appear like mushrooms on a dunghill, with impunity. Beall, in a spirit of admirable transparency, lists his criteria for inclusion on the list,⁷⁴ but sadly he undermines his argument by including as one criterion, among many valid ones, the 'exclusion of any female members' on the board. Needless to say, that cannot possibly be a criterion of scientific integrity and in fact encourages science to become further mixed up with politics. That's how badly the waters of academic science are muddied. In his defence, perhaps he would not just have had to fear for his job, but would actually have lost it had that criterion not been included. (Perhaps if I had one, I'd lose mine for pointing this out.)

The same corrupt model may operate in 'selecting' speakers for profit-seeking conferences. Christoph Bartneck, an IT lecturer from New Zealand, knows, by his own account, next to nothing about nuclear physics, but decided to submit the abstract of a paper for consideration to the International Conference on Atomic and Nuclear Physics to be held in Atlanta, Georgia, in 2016. The paper was accepted. How on earth did he manage that? Simple. He got the autocomplete function on his iPhone to compose nonsense sentences, which he would trigger with a vaguely appropriate word. A typical sample follows:

Molecular diagnostics will have been available for the rest by a single day and a good day to the rest have a wonderful time and aggravation for the rest day at home time for the two of us will have a great place for the rest to be great for you tomorrow and tomorrow after all and I am a very happy boy to the great day and I hope he is wonderful.

He then sent it in under the name ‘Iris Pear’, a jokey reconfiguration of Siri Apple, complete with a fetching photo of ‘Iris’.⁷⁵ The fact that it was accepted within three hours of submission, along with a request for payment of a \$1,099 registration fee, tells you what you need to know.

Plagiarism is a further problem, but in practice hard to spot without much close scrutiny. As Charles Seife found out when he subjected the 16 papers in one issue of *Diagnostic Pathology* to detailed examination, and found suspicious irregularities in six of them,

the dubious papers aren’t easy to spot. Taken individually each research article seems legitimate. But in an investigation by *Scientific American* that analysed the language used in more than 100 scientific articles, we found evidence of some worrisome patterns [indicating plagiarism of language rather than results].

As one editor put it, ‘obviously, it’s a matter of great concern. I’m distraught to think of this going on and flooding the market.’⁷⁶

In some cases, the data are completely fabricated, as the case of a paper, published in the prestigious journal *Science* in 2015, and with the name of a world-renowned political science professor at Columbia attached to it, demonstrated.⁷⁷ But it’s not just, of course, in political science, which is inherently imprecise. Take, for example, anaesthetics, which is about as far as medicine gets from psychological human variables. Scott Reuben, while Professor of Anaesthesiology at Tufts, fabricated every clinical trial he reported over a prolific publishing career, and was jailed in 2009.⁷⁸ Joachim Boldt, another anaesthetist and a professor at Giessen, was suspended in 2010: 88 out of the 102 studies published by him over a 10-year period have now been retracted after data were found to be fabricated and other ‘ethical misdemeanours’ were found in his work.⁷⁹ But no-one quite

matches another anaesthetist, Yoshitaka Fujii, a former associate professor of anaesthetics at Toho, who was found to have falsified 183 papers, netting the world record for retracted science papers.⁸⁰ What is it about anaesthetists? I imagine that anaesthetists are no more corrupt than anyone else: it's just that they have long spells of boredom, which can be fruitfully employed in casting a critical eye over one's rivals' papers.

I remarked earlier that it increasingly seems that papers are not written for the human reader. This may be because they are not written by a human author. One of the most highly reputable science publishers in the world, Springer Verlag, had to withdraw 120 papers from its various publications after they were found, literally, to be gibberish that had been created by computer programs that simulate science writing.

Cyril Labbé, a computer scientist in Grenoble, went one better, and, as well as generating 102 fake papers, invented an author by the name of Ike Antkare (pun presumably intended), and entered them on Google Scholar, bringing the non-existent Antkare's H-index, a measure of productivity and impact, to 94, making him the 21st most cited scientist in the world.⁸¹

Of course such successful hoaxes are not confined to science. Indeed, it is particularly in the humanities that they first became notorious. I discuss some particularly nice ones in Appendix 2. The point is not that corruption is especially prevalent in science (although, to be entirely fair, that equally cannot be excluded, if only on the grounds that the intensity of competition to be first in achieving a 'breakthrough', the colossal available prestige, and the sheer volumes of cash at stake in such research programmes, act as potent inducements – none of which operate to the same extent in the humanities). No, the point is just this: that science is not *immune* from corruption on a fairly significant scale, and the significance is directly proportionate to the claims that are ritually made on science's behalf. After all, some science-naïve observers often seem gullible enough to believe that scientific pronouncements, *ipso facto*, represent 'the truth' with a capital T – not a problem usually experienced by authors of papers in the humanities.

In a sting operation, slightly differing versions of a deliberately flawed paper whose method, according to its author, should have been rejected by a high-school chemistry student, and whose results were meaningless, were submitted to 304 journals worldwide. The *majority* accepted it for publication, frequently asking for minor changes to format or layout. Only 36 of the 304 submissions generated review comments recognising any of

the paper's scientific problems. And 16 of *those* were accepted by the editors, despite the damning reviews. The fact that it came from a non-existent biologist, a Mr Ocorrafoo Cobange, at the non-existent Wassee Institute of Medicine in Asmara, didn't cause a hair to be turned.^{[82](#)} All of which leads to the question: what happened to peer review?

PEER REVIEW

Peer review may manifestly not take place, but at times even what appears to be peer review isn't. In November 2014 it was reported that

in the past 2 years, journals have been forced to retract more than 110 papers in at least 6 instances of peer review rigging. What all these cases had in common was that researchers exploited vulnerabilities in the publishers' computerized systems to dupe editors into accepting manuscripts, often by doing their own reviews. The cases involved publishing behemoths Elsevier, Springer, Taylor & Francis, SAGE and Wiley, as well as Informa... 'As you make the system more technical and more automated, there are more ways to game it', says Bruce Schneier, a computer-security expert at Harvard Law School's Berkman Center for Internet and Society in Cambridge, Massachusetts. 'There are almost never technical solutions to social problems.'⁸³

Nine months later Springer Verlag had to retract 64 articles in 10 journals, after an internal investigation discovered fabricated peer review reports linked to their publication. BioMed Central, an arm of Springer, retracted 43 articles when it found that researchers submitting a paper for publication had suggested suitable reviewers, but supplied contact details for them that actually routed requests for review back to the researchers themselves.⁸⁴

So peer review may be absent, or it may turn out to be self-administered. But what are we to think of peer review when it is functioning relatively normally? Few views are likely to be more informed than that of Richard Smith, since he is a scientist himself, and spent his life dealing with peer review as the editor of one of the most prestigious medical journals in the world, the *BMJ*. In a now famous article he drew attention to its pitfalls.⁸⁵ According to Smith, peer review is impossible even to define, and is 'thus like poetry, love, or justice'. For a start, he asks, who is a peer?

Somebody doing exactly the same kind of research (in which case he or she is probably a direct competitor)? Somebody in the same discipline? Somebody who is an expert on methodology? And what is review? Somebody saying ‘The paper looks all right to me’, which is sadly what peer review sometimes seems to be.

‘People have a great many fantasies about peer review’, he continues, ‘and one of the most powerful is that it is a highly objective, reliable, and consistent process’. Rather, he suggests, peer review is ‘a subjective and, therefore, inconsistent process ... something of a lottery’:

You submit a study to a journal. It enters a system that is effectively a black box, and then a more or less sensible answer comes out at the other end. The black box is like the roulette wheel, and the prizes and the losses can be big. For an academic, publication in a major journal like *Nature* or *Cell* is to win the jackpot.

How to assess peer review’s value? ‘The most important step on the journey was realizing that peer review could be studied just like anything else’, writes Smith. ‘At the time it was a radical idea, and still seems radical to some – rather like conducting experiments with God or love.’

A systematic review of all the available evidence on peer review concluded that ‘the practice of peer review is based on faith in its effects, rather than on facts’.⁸⁶ The evidence is that reviewers agree only slightly more than they would by chance, and that ‘sometimes the inconsistency can be laughable.’ Noting that it is ‘slow, expensive, profligate of academic time, highly subjective, prone to bias, and easily abused’, Smith points out that asking authors to pay for peer review, as they increasingly are, is ‘ironic’. Peer review, according to Smith, is

a flawed process, full of easily identified defects with little evidence that it works. Nevertheless ... scientists and editors have a continuing belief in peer review. How odd that science should be rooted in belief.⁸⁷

For hundreds of years during the great age of Western science, papers were reviewed by the editor or editors alone. Early attempts at a form of peer review in the nineteenth century already found that referees were soon overwhelmed, that the problem of bias was intractable, and that it had become an obstacle to scientific progress, because it made it almost impossible to say something not already accepted by the establishment. Outside Britain and America it was therefore not widely accepted till relatively recently. Indeed even there: *Nature* did not establish a formal peer review process until 1967. Of Albert Einstein's 301 publications there is evidence that only one underwent peer review (in 1932): 'interestingly, he told the editor of that journal that he would take his study elsewhere!'⁸⁸

The point about the laboriousness of the process – possibly worth it if it works, certainly not if it doesn't – reminds one of the physicist Leo Szilard's visionary satire, 'The Mark Gable Foundation', published in 1961. The story described the creation of an endowed not-for-profit foundation for the specific purpose of *slowing the pace of scientific progress*. The originator of this plan was a physicist who had emerged from a cryogenic coma 200 years into the future to find that most of his training was obsolete and that science was progressing altogether too fast. He therefore enlisted the help of the world's wealthiest man in creating a non-profit organisation to retard scientific progress.

His method of achieving this worthwhile objective was to create for each major field of scientific investigation a panel of distinguished scientists which would meet monthly to award prizes and grants for the best recent scientific work. This technique, it was explained, would keep the best of the older scientists away from their laboratories and busy with unproductive meetings and travel, and would cause the younger scientists in need of funds to go for the 'sure thing' which would be certain to lead to publishable results, thereby channelling research in the direction of the safe, the fashionable, and the obvious and away from more risky innovations and seeking for breakthroughs at the frontiers of knowledge.⁸⁹

'By going after the obvious', he wrote, 'pretty soon science would dry out. Science would become something like a parlour game ... There would

be fashions. Those who followed the fashions would get grants. Those who wouldn't would not.'⁹⁰

Peer review may be a real break on progress. A paper signed by 200 academics argued that, despite the potential benefits of peer review, 'the process of peer review can be prone to bias towards ideas that affirm the prior convictions of reviewers and against innovation and radical new ideas. Innovative hypotheses are thus highly vulnerable to being "filtered out" or made to accord with conventional wisdom by the peer review process.'⁹¹ A further serious problem is flagged up by the philosopher JL Auspitz: 'There are never peers to review unique work, and the very bureaucratisation of intellectual labour entrenches the conventional'.⁹² A process clearly inimical to science and the life of the mind – as is the extreme pressure put on scientists, *not* by the science establishment, but by the conventional press and academics in non-scientific subjects, who often know little or nothing about the research findings to date in the area, not to research, publish or even *discuss* areas in which it is feared findings might show their politically motivated beliefs to be unfounded. That, too, distorts what science can teach us.

The *BMJ* carried out several studies in which major errors were deliberately inserted into papers and then sent to many reviewers.⁹³ 'Nobody ever spotted all of the errors: some reviewers did not spot any, and most reviewers spotted only about a quarter.'⁹⁴ The studies concluded that peer review was not a reliable method of eliminating error or fraud, something of which we have already noted ample evidence. 'Robbie Fox, the great twentieth-century editor of the *Lancet*', Smith notes, 'joked that the *Lancet* had a system of throwing a pile of papers down the stairs and publishing those that reached the bottom.'⁹⁵

It is also obviously a process that is open to pretty gross bias. As science research has shown, the same paper with high-recognition names attached may be accepted for publication, when without them it is rejected.⁹⁶ Worse, papers by prestigious authors previously accepted may be turned down when re-presented to the *same journals* with unknown names and institutional affiliations. In one famous study by Steve Ceci and Douglas Peters, 12 papers from prestigious institutions, papers that had already been published, were faithfully retyped, except that the names of the authors and institutions were changed to fictional ones, such as Dove Ceters (a

conflation of the researchers' names) from the 'Northern Plains Center for Human Growth and Potential'. The papers were then resubmitted to the same journals that had first published them.⁹⁷

Of the sample of 38 editors and reviewers, only three detected the resubmissions. The other nine out of the 12 articles continued to receive evaluation, and eight of those nine were rejected; 16 of the 18 referees recommended against publication and the editors concurred. The grounds for rejection were in many cases described as 'serious methodological flaws' (remember, these were papers from prestigious institutions already published *in the same journals*). Elsewhere the authors comment:

None of the twenty reviewers who recommended rejection even hinted at the possibility that a manuscript might be acceptable for publication pending revision or rewriting. These findings were a convincing demonstration of the unreliability of peer-review.⁹⁸

Since by 1982 the correlation between dollars granted to institutions and the numbers of biomedical publications was already 95% (it is higher today), this corrupt process has a serious impact on research.

Funding which is so crucial for various types of research is available only in greatly reduced amounts to individuals at low status institutions. In the long run these individuals end up teaching heavier loads and having less graduate and undergraduate support to aid them in their research interests ... These data, however, provide absolutely no support for the belief that federal tax dollars are best spent by awarding grants to researchers at the largest and most prestigious universities.⁹⁹

For saying this, the researchers could not go unpunished.

Upon collection of the data we entered a period lasting approximately two years during which we experienced an intense and negative reaction from many powerful individuals in our profession for having conducted our study. One editor in the study wrote a letter threatening a lawsuit ... Other negative repercussions

included several threats to professionally censure us, and threats to reject the work of our colleagues, supposedly because they had been part of a department that had approved such ethically bankrupt research ...

‘Obviously’, they continue, ‘the journal review system has become a “sacred cow” to some’. They go on to describe how things unfolded:

These personal attacks took their toll ... Finally, after two unsuccessful attempts to publish our findings, replete with personally insulting *ad hominem* reviews, we found a publisher and positive reviews. Soon press releases were telling a diverse audience of our findings. Letters of support (over a thousand) came pouring in. Every one of them was complimentary ...¹⁰⁰

Ceci and Peters were not, however, alone. Canadian researcher Cannie Stark-Adamec had recently documented the successful resubmission of her own non-funded grant proposal to the same granting agency, unchanged except for the addition of a prestigious co-author and the tripling of its budget.¹⁰¹

Ceci and Peters were effectively whistle-blowers. It is worthy of note that those who act in defence of the proper principles of science are attacked by the corporate science establishment for being *traitors*. The only *traitors* here are those who are not faithful to science herself: their accusers. This kind of angry projection of your own failings onto others is almost always to be found when corporate employees blow the whistle.

Most worryingly, peer review is a process that is obviously open to fraud of the most heinous kind. Ioannidis writes: ‘Prestigious investigators may suppress via the peer review process the appearance and dissemination of findings that refute their findings, thus condemning their field to perpetuate false dogma.’¹⁰² It is clearly also possible to produce an unjustly harsh review to block or delay a competing publication and even to steal a competitor’s ideas:

Drummond Rennie tells the story of a paper he sent, when deputy editor of the *New England Journal of Medicine*, for review to Vijay

Soman.¹⁰³ Having produced a critical review of the paper, Soman copied some of the paragraphs and submitted it to another journal, the *American Journal of Medicine*. This journal, by coincidence, sent it for review to the boss of the author of the plagiarized paper. She realized that she had been plagiarized and objected strongly. She threatened to denounce Soman but was advised against it. Eventually, however, Soman was discovered to have invented data and patients, and left the country.

The reader might be forgiven for thinking Soman must have been a minor figure in an obscure institution. However, he had won a fellowship in endocrinology at the Yale School of Medicine, was appointed to its faculty the next year, and had publications in journals such as *Nature* and *The New England Journal of Medicine*. His senior collaborator on the paper under attack was Dr Philip Felig, a highly respected medical researcher, the occupant of an endowed chair and chief of endocrinology research at Yale. Lawrence suggests that ‘anonymous referees who murder papers for gain, who take advantage of privileged information or who share the contents of reviewed papers with others should be held to account’.¹⁰⁴ They rarely are.

Such human misdemeanours are not an indictment of science, any more than misbehaviour by clergy is an indictment of religion. But it complicates the idea that a paper’s having been peer-reviewed and published in a leading journal is a test of its integrity as science. And there is no other test available for most of us. Worse, since misdemeanours in the representation of science reflect not just on the moral stature of the individual but on the status of what is claimed in the name of science, they have a further toxic reach.

Attempts to improve the process by blinding reviewers to authors, making their names openly available to authors, and training reviewers have met with little success, as Smith reports.¹⁰⁵ What to put in its place? Research done at the *BMJ* itself indicates that having the value of a paper judged by the editor, or at least a small group of editorial staff, would be likely to produce just as good results, while obviously being much quicker, much less expensive, completely transparent, less open to malpractice, no more prone to bias, and no longer wasteful of the massive amount of potential research time currently lost to the process.¹⁰⁶ Impervious to any

such argument, the left hemisphere-dominated mindset insists that there is no viable alternative to the current system, and that it is working fine anyway.

This situation is reminiscent of science departments having to assess the ‘score’ of a researcher, rather than take the person they want. That is open to bias, certainly. But it’s not as if the alternatives are any less open to bias of other kinds. Bias is intrinsic to human life. We just waste a lot of time and money pretending we’re avoiding it, and then kid ourselves that the outcome was ‘objective’ – a more dangerous position, because it introduces complacency and is a much more difficult thing to fight, precisely because of its appearance of objectivity. As often in life, it is not what you know, but who you know that counts. Scientists are under pressure to show their faces at conferences, ‘network’ successfully there, befriend and make up to journal editors. Leaving your desk to network is, from the point of view of those who love science not the science institution, a dispiritingly rewarding career move.

And, just as in practice people will get on better with people they want to work with, a journal might have much more character if the editor chose what to publish. Competition means that someone who believes a paper chosen by the editor is mistaken will soon find another journal to accept their counterargument (or the same journal might well do so). A poor editor would soon find himself sitting on a depreciating asset, just as an employer who routinely made bad decisions would go out of business. And there would be more openness.

Serious scientists and science publishers are rightly concerned by the difficulty in policing a rapidly changing market in which trust has to an extent broken down, and in which pressures to succeed and inducements to distort truth or commit fraud are large. It is true that reports of gross fraud are not common given the vast number of articles published annually, but its full extent is clearly not known – we only hear about the cases that are exposed, and exposing deceit is hard compared with its commission.

The well-worn response that the problems are small and that being concerned about them is an ‘attack on science’ simply won’t do any more. Yet, naturally, one continues to hear it. An example is the contribution to *The Oxford Handbook of the Science of Science Communication* by Joseph Hilgard and Kathleen Hall Jamieson in which the media are blamed for an ‘attack on science’ in reporting publishing scandals, and in which the

authors recommend in future that such news be projected as examples of the success of science (supposedly succeeding in correcting itself). Nowhere in their piece is the true extent of the problem acknowledged or genuine concern about it expressed. Instead it is assumed to be a largely manufactured problem rooted in prejudice; instead of some serious soul-searching, we find only the usual symptoms of a failing establishment, defensiveness and complacency.¹⁰⁷ Meanwhile, those who defend science from bad scientists are, of course, to be treated as traitors.

PUBLIC HEALTH POLICY (SEE APPENDIX 3)

Finally here, let me very briefly address a slightly different question: how reliable is public health policy – advice on how to lead healthy lives? If the answer should turn out to be ‘not very’, this would be less damaging to the status of science itself as a path to truth, since it is less a matter of the reliability of the evidence, more of the uses to which it is put. However, it is still promulgated by scientists and scientifically trained officials who advise governments, so they cannot abjure responsibility altogether; and for most of the population it is the most obvious way in which the impact of the science establishment is felt in their lives.

I cannot report good news. Much of what is promulgated has little, or in some cases no, basis in evidence. The public would be deeply shocked if they knew the truth. On smoking, above all, and obesity to a great extent, it is generally reasonable and valuable; and there it has saved and will continue to save lives. But on fat, salt, alcohol and water consumption the distortions are so egregious as to court ridicule. At times, as I will point out, it has the potential to be actively damaging. I discuss the issues in Appendix 3, to which the interested reader is recommended. Overall we see in public health advice the hallmarks of the left hemisphere mindset at work: the triumph of theory over fact; denial when the evidence does not fit what one already just ‘knows’ to be the case; a refusal to see health in the round; disregard of context; cut and dried positions; and an obvious desire to control.

As readers of Appendix 3 will see, large vested interests badly interfere with objectivity. Industry funding of research distorts the publication of findings. It may be tempting to some to say that while behind these fallacious public policies masquerading as science there were financial pressures (eg, the sugar industry), pressure groups (eg, the anti-alcohol lobby), and a desire to fall in with received ‘wisdom’, even if it is received folly, none of this could operate in ‘real science’. But that would be complacent. Financial pressures operate throughout the world of academic science just as they do in public science. To begin with, and perhaps unsurprisingly, how much money is spent on a science project, and how many papers result from it, often substitute as measures of worth, skewing

the evolution of scientific thinking. Or big business can bully. The distinguished psychiatrist and psychopharmacology expert David Healy was offered a post as Director of Toronto's Centre for Addiction and Mental Health, and a Chair in the Department of Psychiatry at the University: after giving a lecture in which he suggested that fluoxetine (Prozac) might increase the risk of suicide, the offer was rescinded. Lilly, the manufacturer of Prozac, was a major contributor to the Centre at the time.

Since science is actually carried out by real people with all their complicated motivations, it is subject to all those human fallibilities, hardly peculiar to science, but from which science is not exempt. It would be kind, but wrong, to assume that no axes are being ground, and there's no boss to please, no prestigious grant to justify, no publication dependent on the outcome and no previously published views to vindicate. The fiercely competitive empires of ambitious academics involve huge grants on which they, their acolytes, and often whole universities depend for prestige and income. Only a very brave or foolish person will sacrifice a lucrative career by saying something unorthodox merely for the sake of scientific progress.

Such human corruption has nothing to do with the hemisphere hypothesis. But narrowness of vision, lack of creativity and imagination, excessive confidence in one's position and a tendency to get fixed in set ways of thinking potentially do – along with anger and denial when challenged.

TIME FOR A NEW PARADIGM?

Originality, branching away from the conventional path, challenging received wisdom, is the essence of good science. Without it, science fossilises: it loses intellectual power, and purchase on reality. Yet truly original work usually takes years to develop and years to be appreciated. To strike out in a new direction has everything against it from the personal point of view. Original thinking takes time – a lot of it – when, if it is to grow, it must not be crystallised too soon. It will be slower in emerging, more likely to be rejected by editors, and, if it gets that far, opposed by reviewers. It will take time to catch on – your ‘impact factor’ will suffer. Perhaps the most important paper in biology of the twentieth century, Crick and Watson’s paper on the double helix structure of DNA, which appeared in *Nature* in 1953, was cited rarely for the first 10 years, and indeed the number of citations actually declined over time (from about seven in the first year).¹⁰⁸ Ernest Rutherford discovered the structure of the atom in May 1911. According to Freeman Dyson, ‘the clear evidence for an atomic nucleus was long ignored by Rutherford’s contemporaries’. His book *Radioactive Substances and Their Radiations*, in which the structure of the atom is for the first time clearly spelt out, was reviewed in *Nature* in 1913 by Lord Rayleigh, ‘surely as broad-minded and versatile a physicist as one could find’; the review did not even mention the subject of atomic structure.¹⁰⁹

The individual researcher is less independent these days. When Rutherford discovered the nucleus of the atom, he published it in a paper with just a single author: himself. By contrast, the two 2012 papers announcing the discovery of the Higgs particle had roughly a thousand authors each. This is a recognisable trend. Many kinds of scientific research, especially those that rely on machines that are expensive to buy and expensive to run, require small empires, in which getting large research grants is the name of the game, bringing power and prestige to those at the top of the pyramid. Rutherford made his discovery with the simplest equipment: he had wanted a big, water-cooled magnet, but is said to have ‘dropped it like a hot cake’ when he learnt its cost.¹¹⁰ Gone are the days when good research was regularly done with the aid of one’s wits and a

pencil and paper – and where, partly because of this, people were given more freedom to pursue interesting ideas of their own that might or might not lead to a breakthrough. Researchers must now show ahead of time the value and likely outcome of their research, an approach which is adverse to the life of the mind. As we saw, tripling your budget increases your chance of publication. The whole process of research is now so predicted and monitored that originality, imagination and serendipity – all essential ingredients in new scientific work – cannot thrive. If we were to stop trying to micro-control the process, some research, it is true, would go slowly nowhere; but if we don't free up the process from such control, we'll all be going nowhere fast.

After analysing more than 65 million papers, patents and software products that span the period 1954–2014, the authors of a paper in *Nature* conclude that:

Experimental and observational research on groups reveals that individuals in large groups ... generate fewer ideas, recall less learned information, reject external perspectives more often and tend to neutralize each other's viewpoints ... Small teams disrupt science and technology by exploring and amplifying promising ideas from older and less popular work.^{[111](#)}

That last phrase resonates particularly with me, since I have found enormous riches in now neglected works produced in a freer and more untrammelled intellectual climate that is not actually so very long – less than a century – ago. Historically, many steps forward – the Renaissance is an obvious example – were taken by rediscovering what certain original scholars saw we had lost sight of, but cast in a new form.

The authors of the *Nature* paper draw attention to the attractions of large research budgets. Scientists, they say, 'like to portray science in a positive light, emphasizing benefits and minimizing negatives. While understandable, the evidence is that science has slowed enormously per dollar or hour spent'. They point out that there has been a falling away of Nobel Prizes awarded in physics for recent work since 1990: 'The 1990s and 2000s have the dubious distinction of being the decades over which the Nobel Committee has most strongly preferred to skip, and instead award prizes for earlier work. Given that the 1980s and 1970s themselves don't

look so good, that's bad news for physics.'¹¹² They found similar results in Nobels for chemistry, and physiology (which includes medicine).

Here we see the results of the left hemisphere mindset at work: profit must be maximised by making sure that everyone is maximally efficient. Thus, through the pursuit of efficiency, effectiveness is destroyed.

Competition for places in the steep hierarchies of the science establishment is fierce, and those who want to get on have no incentive to question, to step out of line in any way, or to think for themselves. There develops what Smolin refers to as a 'swaggering' and 'arrogant' style, which is used to intimidate and discourage anyone who questions the conventional wisdom.¹¹³ Yet

science requires a delicate balance between conformity and variety ... if science is to move forward, the scientific community must support a variety of approaches to any one problem ... While few would disagree with the rhetoric of diverse views, it is being practised less and less ...¹¹⁴

The point about diversity of approach is not primarily about giving everyone a fair deal. It is not about individuals at all. It is about the viability of the *communal* business of science.

Although objectivity, in the sense of a fair consideration of all possibilities, is a fine aim, objectivity in the sense of adopting a viewpoint that makes no presuppositions is, as I have suggested, intrinsically impossible to achieve. Fortunately science does not require objectivity. 'One of the strengths of science', writes historian of science David Hull, 'is that it does not require that scientists are unbiased, only that different scientists have different biases.'¹¹⁵ There's wisdom in that: but for that to be the case, one needs science to be open to as many different points of view as possible.

Smolin continues:

There are fewer corners where a creative person can hide, secure in some kind of academic job, and pursue risky and original ideas ... Whereas university faculties have stopped growing, there has been a marked increase in the number and power of administrators. Thus,

in hiring, there is less reliance on the judgment of individual professors and more on statistical measures of achievement, such as funding and citation levels. This also makes it harder for young scientists to buck the mainstream and devote themselves to the invention of new research programs ... It often seems as though achievements requiring nothing more than cleverness and hard work are valued more highly than probing thought or imagination. Intellectual fads are far too important, and people who ignore them have dicey academic careers ... universities don't function well as vehicles for innovation, even when nothing more is at stake than modernising a curriculum that is eight decades behind the science ... good ideas are not taken seriously enough when they come from people of low status in the academic world; conversely, the ideas of high status people are often taken too seriously.¹¹⁶

A significant point here is that even if professors were not, as they now are, constrained by having to make decisions on the basis of indices, etc, they are now increasingly likely both to have done too much line-toeing during their formative years, and to want to retain their position, its emolument, and the chance of public recognition, by continuing to conform to whatever 'standards' administrators impose. Modern science, writes Peter Lawrence,

particularly biomedicine, is being damaged by attempts to measure the quantity and quality of research ... The measures seemed, at first rather harmless, but, like cuckoos in a nest, they have grown into monsters that threaten science itself. Already, they have produced an 'audit society'¹¹⁷ in which scientists aim, and indeed are forced, to put meeting the measures above trying to understand nature and disease ... trying to meet the measures involves changing research strategy: risks should not be taken as this can mean long periods trying out new things, good for the originality of research but bad if a grant has to be renewed.¹¹⁸

This development is also a good example of how an attempt to enforce 'objectivity', in order to increase fairness and diversity, a left hemisphere

misapprehension, leads to a skewed situation in which diversity is minimised and true fairness – that the excellent should flourish – is travestied, with the result that neither academe as a whole, nor the creative individual, is better off. Mediocrity results, and science, and therefore all of us, are the poorer for it.

Even those who toe the line sufficiently to remain in a team that is successful in this game of snakes and ladders will find that the need to maximise publications causes juniors to be treated more like technicians than encouraged to become the scientists of the future. Yet this is the most important time for them to be untrammelled. Original work in a field like physics was often in the past achieved by those least worn down by the pressures of conformity and most open to fresh thinking: the young. Newton was 23 when he developed his theory of gravity. Einstein was 25 when he discovered the theory of relativity; Pauli was 25 when he announced his exclusion principle; Heisenberg was 26 when he presented his uncertainty principle; Dirac was 26 when he discovered his relativistic equation; Bohr was 28 when he developed his atomic theory; De Broglie was 28 when he made his breakthrough in wave mechanics; and even Schwinger and Feynman found the renormalisation solution before the age of 30, despite the interruption of World War II.¹¹⁹ This is not because young people are cleverer, and it cannot be that they know more: it is surely that their minds are more open than those of their seniors.

Research shows that there is a surge in original publication in an area once a leading figure dies, and that real advances are obstructed by a prestigious establishment with no reason to be prised away from the view it has always held.¹²⁰ ‘A new scientific truth’, said Max Planck, the originator of quantum theory, ‘does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.’¹²¹

The celebrated neurologist and brain researcher Norman Geschwind saw a larger picture that disturbed him. ‘There is a widely held supposition that one’s scientific peers are honest, well informed, not swayed by prejudices, and *open to imaginative adventures into the unknown*’. He calls this supposition ‘a utopian faith in scientific advance’, one that is contradicted by ‘many occurrences which demonstrate that although science has replaced religion in the minds of many educated people, the unquestioning belief in the virtues of scientists may be as misinformed as

the older faith that the clergy were always the true repository of spiritual values.’ He refers to ‘the many instances of deliberate falsification of data’, and mentions (writing in 1984) that ‘within the last several years’ researchers at the medical schools of Harvard, Yale, Cornell, and Boston University had been dismissed as a result of inventing or plagiarising data.’¹²²

What I would emphasise here is not that this less than sweet-smelling hierarchy is merely unpleasant, self-serving and corrupt – most hierarchies are – but how much it is *not* imaginatively open. And Geschwind notices a discrepancy that I also find troubling. ‘There is a vehement reaction’, he writes, ‘against what are construed to be anti- or pseudo-scientific activities ... yet instances of scientific fakery activity are typically regarded as random aberrations which lead to unfavourable publicity.’ This despite the fact that ‘examples of scientific chicanery have been so common that one can hardly neglect them’.¹²³

What makes Geschwind’s account so pertinent here is that his observations are set against the backdrop of a setback in neurology occasioned by the almost total suppression, for about 60 years, of vitally important information about the effect of disconnecting the two brain hemispheres – because it didn’t happen to fit the prevailing theory. It is often thought that we started to learn about hemisphere disconnection only with the first split-brain operations in the 1960s. However, there are brilliant, detailed and vivid accounts of the effects of stroke affecting the corpus callosum going back to Hugo Karl Liepmann in 1900,¹²⁴ and Kurt Goldstein in 1908,¹²⁵ the latter being reported and discussed in *Brain*, Britain’s most prestigious neurology journal of the period, in 1914 by Kinnier Wilson.¹²⁶ ‘The remarkable fact is, writes Geschwind,

that despite these superb descriptions of the clinical picture of callosal disconnection by master observers, and the confirmation of the location of the damage at post-mortem examination, almost every bit of this fundamental knowledge disappeared from the neurological literature ... Even more striking than the neglect of this original knowledge concerning the functions of the corpus callosum and its disorders was the appearance in the literature of incorrect

descriptions or bold statements that nothing was known about the callosum and its functions.'

To Geschwind's amusement, Walter Dandy, a pioneering neurosurgeon at Johns Hopkins, 'went so far as to state that, on the basis of his own experience, he could dismiss all the fantastic claims which had been made for the functions of the great cerebral commissure.'¹²⁷

Science has two opposing thrusts, although they are often imagined to be aligned. It cannot avoid operating under a paradigm, because, without such a paradigm, its findings could not cohere. This is not a criticism but an inevitability. Not inevitable, however, though highly likely for a range of reasons, is that in practice this leads to science being resistant to imaginative insights. For almost all scientists, almost all of the time, the business of science is the solving of problems which are framed and interpreted solely within the prevailing paradigm. This is what Thomas Kuhn refers to as 'normal science'. It leads to further establishment of findings within the paradigm, but it militates against those great insights that change the direction of scientific history, despite this being widely believed to be precisely what science is about. 'Few people who are not actually practitioners of a mature science', writes Kuhn in his landmark work, *The Structure of Scientific Revolutions*,

realise how much mop-up work of this sort a paradigm leaves to be done or quite how fascinating such work can prove in the execution. And these points need to be understood. Mopping-up operations are what engage most scientists throughout their careers. They constitute what I am here calling normal science. Closely examined, whether historically or in the contemporary laboratory, that enterprise seems an attempt to force nature into the preformed and relatively inflexible box that the paradigm supplies. No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies.¹²⁸

This can become a self-referential, self-validating procedure, which is all the more devastating because true science is neither of those things.

The attempt to save the paradigm is a perfectly reasonable one, but only if it is balanced by an equal willingness to be aware of its limitations in the face of new evidence. Too little adherence to the paradigm and the wheels of science spin without purchase; too great adherence and they are stuck. In either case no progress is made. It is much more comfortable not to raise new ideas, because they will be met with opposition or ridicule, and most people are petrified of stepping out of line, not least because their career prospects depend on toeing it. A recent article entitled ‘A call for an open, informed study of all aspects of consciousness’, signed by 100 scientists, many of them holding chairs at prestigious universities, made the point that research into consciousness is hampered by blind adherence to an unproven dogma that consciousness must arise only from material causes.¹²⁹ Our minds are so constructed that we actually don’t even see the discrepancies that our theory involves until the deviations are so gross we have no alternative.¹³⁰

The certainty that what one was taught to believe must be right afflicts even the best scientists. It meant that Tycho Brahe could never accept Copernicus’s discovery of the circulation of the earth round the sun, and that Justus von Liebig, the founder of organic chemistry, could not accept the germ theory of disease put forward by Louis Pasteur and Robert Koch. In the words of Bernard Barber, ‘because of their substantive conceptions and theories, scientists sometimes miss discoveries that are literally right before their eyes.’¹³¹

Stepping out of line is a very serious business that takes moral courage: whether right or wrong, you will be vilified by some and may lose your livelihood. In case you think that might be an overstatement, I can tell you that many scientists say in private that they believe in purpose in nature – with no necessary implication of a designer God – but cannot say so in public for fear of losing their job. Purpose in nature is not the same as Intelligent Design, but Intelligent Design is of course anathema to mainstream science.

Take the case of the distinguished palaeontologist Dr Günter Bechly. Until 2016 he was Curator for Amber and Fossil Insects in the Department of Palaeontology at the State Museum of Natural History in Stuttgart, a highly prestigious post. According to his website not only has he published

over 160 peer-reviewed scientific papers, but he has described, or co-described, 172 new species, and numerous new genera and higher taxa, including three new orders of insect; no less than 11 taxa have been actually named after him. So hardly an outsider to scientific research. He put on one of the largest, if not the largest of, celebrations in Germany of Darwin's work in the bicentenary year of Darwin's birth, 2009: the exhibition, which attracted around 100,000 visitors, and which was designed to refute Intelligent Design theory, was awarded a coveted prize. However, he made the mistake, during the Darwin celebrations, of thinking that he really ought to read the pro-design books that he had put up to be dismissed. When he did, he found to his surprise that they had been misrepresented. They were much more sophisticated than he had been led to believe. He then had a crisis of conscience. Having been a lifelong atheist, and a follower of Richard Dawkins,¹³² in 2015 he was foolish enough – or brave enough – to express open support for Intelligent Design: 'I did not change my views in *spite* of being a scientist but *because* of it, based on a careful and critical evaluation of empirical data and rational arguments, following the evidence wherever it leads', Bechly says.¹³³ He was immediately forced to leave his post; and English-language Wikipedia, until then, understandably, considering him a considerable scientist meriting a Wikipedia page, removed his entry. He has become effectively a non-person.

Let me be clear: I am not in a position to judge whether Bechly is right. I do not espouse Intelligent Design as I understand it (though I suspect that there is a broad range of views gathered under that rubric), for reasons that will become more obvious to readers of Part III of this book: but I also do not dismiss those who hold to it, since I simply do not know enough to be dogmatic. My point is that, in a properly functioning scientific establishment, the expression of such views should at least be entertained, if not welcomed, and certainly not silenced. If the argument has been already conclusively decided against teleology, it should not prove difficult to counter such views, and in doing so to enlighten those who really want to know the truth. But it has not. Such beliefs are widespread among scientists. Over 1,000 scientists, including those holding academic posts at or holding doctoral degrees from universities including the likes of Oxford, Cambridge, Harvard, Yale, Stanford, Princeton, Cornell and MIT, have risked jeopardising their careers and livelihoods by signing a statement that 'we are skeptical of claims for the ability of random mutation and natural

selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged.’ According to Philip Skell, a member of the United States National Academy of Sciences, and a former Evan Pugh Professor (an award for exceptional achievement) at Pennsylvania State University, ‘scientific journals now document many scientific problems and criticisms of evolutionary theory and students need to know about these as well ... Many of the scientific criticisms of which I speak are well known by scientists in various disciplines, including the disciplines of chemistry and biochemistry, in which I have done my work.’¹³⁴ The irony is that Darwin, in his modesty, would have been all in favour of taking such views seriously. The neo-Darwinists, it would seem, are less enthusiastic about doing science.

Then there is the discrepancy in status that turns established senior figures against their perceived inferiors. Though, in the best case, their very status might free them to think more imaginatively, more established figures, of higher status, have had more reinforcement of their preconceptions, and have more to lose by embracing new ideas. Geschwind remarked that ‘it has become increasingly clear that scientists, even when honest, may engage in destructive competition and backbiting, often at the expense of vulnerable and junior people.’¹³⁵ The great botanist Karl von Nägeli patronised and dismissed the humble monk Gregor Mendel, whose experiments laid the foundations of modern genetics. And there is a prejudice against outsiders, who have the advantage of not starting with the same preconceptions. Helmholtz’s crucially important discoveries in physics were dismissed because he was a medical doctor and philosopher by training; equally Pasteur’s and Magendie’s medical discoveries were dismissed because they were not physicians.

There is a tendency for many scientists to take an uncritically contemptuous, and at times, frankly, self-righteous attitude, to whatever might challenge the mainstream of conventional thinking. This is not only unattractive, but unscientific. We are rightly scandalised when the clergy put preservation of the comfortable edifice of the Church ahead of abiding by Christian principles in practice. Why are we tolerant of scientists who, *mutatis mutandis*, do the same thing? My claim is certainly not that there is something wrong with science, but that the contemporary science establishment is *not scientific enough*. That would require keeping an open mind and taking seriously, as does physics, non-mechanistic models.

Seriously enough to deal with them fairly. What we have here amounts to a groundless prejudice. As a result we are both missing great potential discoveries and stultifying the human mind. ‘Science means, first of all, a certain dispassionate method’, wrote William James:

To suppose that it means a certain set of results that one should pin one’s faith upon and hug forever is sadly to mistake its genius, and degrades the scientific body to the status of a sect ... Although in its essence science only stands for a method and for no fixed belief, yet as habitually taken, both by its votaries and outsiders, it is identified with a certain fixed belief, – the belief that the hidden order of nature is mechanical exclusively, and that non-mechanical categories are irrational ways of conceiving and explaining even such things as human life.^{[136](#)}

The left hemisphere mindset likes conformity, seeks power, and has difficulty understanding the non-mechanical. I suspect it is operant here. It also tends, as we know only too well, to denial.

CONCLUSION

Science is a project that, when carried out in a spirit of humility, is exciting, and potentially beautiful and good, even if not necessarily always in possession of the truth. It can offer no answers that are not framed by a context – because truths are always limited by context. Earlier I quoted Whitehead to the effect that the question to be asked of scientific claims is under what circumstances they are true and under what circumstances they are false. This question often remains unasked. The left hemisphere tendency, unlike that of the right, is to take things out of context: yet it is awareness of context that gives us necessary awareness of the fallibility of a dogma. In philosophy there is a position known as ‘pessimistic meta-induction’, which views the history of science as the history of perennially mistaken ideas. While this does seem a very one-sided way of looking at things, it reminds us that today’s fact is tomorrow’s artefact.

The theories of Einstein could be put to the test, though they cannot be proved, and may need to be modified in the light of further information. Neither Darwin nor Freud produced hypotheses that can be ‘disproved’ by any conceivable experiment. It is a myth that science depends on such a stipulation. Even single findings, never mind whole theories, may prove very hard to falsify. Falsification is a complex business, characterised by incremental judgments, not by unambiguous precision. It is a matter of testing new ideas out against the rest of our experience of the world, in Darwin’s case the natural world, or, in Freud’s case, the human inner world – a matter of whether they open our eyes to something, so that after that we can hardly *ignore* the truth it constantly unconceals. That is the only possible test of great truths. As Richard Feynman said during his Nobel Prize acceptance speech in 1965: ‘A very great deal more truth can become known than can be proven.’ And, I might add, a very great deal more falsehood can become known than can be disproved.

Willard Quine and Pierre Duhem pointed out that things are not propitious for those who demand proof, since not only can a finding never be proved, as is widely accepted, but it cannot be finally *disproved*, either. This is because each finding is embedded in a host of assumptions, and it may be one of those assumptions that is at fault, not the finding. We simply

cannot avoid the exercise, however hard we try, of (informed) personal judgment. That doesn't, of course, entail that every judgment will be equally valid; just that the issue isn't subject to proof.

Interestingly the word 'proof', which now means a way of showing that something is the case beyond doubt, used to mean a trial run, as in a proof of a printed article, or putting something to the proof, tasting it, trying it out (cf French *éprouver*). It was a trial, in the sense of trying something out (for that word, too, is slippery) rather than a trial in the sense of a legal process leading to a judgment of fact. When one is 'trying' something nowadays, is one opening oneself to the experience, without which one will never know? Or 'trying' it in the sense of a court of law, whereby it will be finally found, in the abstract, to be right or wrong? The word 'experience' comes from the Latin *experientia*, from *experiri*, meaning to 'try out'. And that comes from the same Proto-Indo-European root *per-* which underlies our word 'peril' and the German word for danger, *Gefahr*. Experience is an inherently uncertain business that carries risk – a risk without which one can learn nothing. Such is our world, and such are the terms of our existence. And such was Blake's perception, when, referring to his own birth, he wrote: 'My mother groaned, my father wept, / Into the *dangerous* world I leapt.'¹³⁷

The right hemisphere view of proof derives its value from the context, and so can never be absolute, regnant for all regions of space and time, and never single or immune from evolution. The idea of truth as independent of us, immutable and certain, is a relatively recent invention. In this chapter I have argued that we need to regain the strengths of the right hemisphere's 'antifragile' idea of truth and proof, and lose the weaknesses of the brittle, 'fragile' left hemisphere idea of each.¹³⁸

Some people think that science must be a principally left hemisphere business. I'd caution that, like absolutely everything else, it has its left hemisphere and its right hemisphere aspects. And, like everything else, science profits from balance and harmony between them. Some kinds of scientific thought, especially the drive to see the overall shape, to draw together disparate findings, to make connexions, to achieve imaginative insight, to evolve, or to modify a hypothesis, to observe things as near as possible as they are (empiricism), and to see whole systems that can't be reduced to linear connexions, are likely to be more right hemisphere-dependent; the drive to make fine distinctions, to investigate localised areas or functions, to preserve the theoretical paradigm at all costs, to achieve

certainty, to see the world in terms of things that are cause and effect to other things, in predictable, linear fashion – all this is more likely to express the contribution of the left hemisphere. Both are essential: though here as always, it is the right hemisphere's role that needs to predominate, taking under its aegis the contribution of the left hemisphere. There needs to be a balance between opening up the flow of thought to possibility and closing it down towards an always provisional certainty. Certainty is always a matter of degree; about that I am as certain as it is humanly possible to be.

As the left hemisphere mode of construing the world predominates, however, things become unbalanced. Science is reconceived as a fundamentalist movement: prone to self-righteousness, closed to unfamiliar ideas, defensive, complacent, open to corruption and risking a lifeless failure of imagination. If you are like me, you will admire science for what it can do at its imaginative, mind-expanding and exciting best, but draw the line at what it never could – namely provide us with dependable, or ultimate, truths.

Seeing that I rely heavily on science, am I not vulnerable to my own arguments? To an extent, yes, of course. But only, I believe, to a limited extent.

There are two ways in which I might be. One is 'essential', and concerns the truth available to science; the other is 'accidental', and is about the validity of the particular evidence on which I rely.

As far as the first is concerned, I don't claim any more than science can legitimately claim – but that is a very great deal. I caused some confusion at the end of *The Master and his Emissary* by suggesting that, while I thought it unlikely I would be wholly right about hemisphere differences, I thought it unlikely I was wholly wrong; and that even in the improbable event that there was *nothing* in my hypothesis about the two hemispheres, and it turned out to be 'just' a metaphor, I would be content, since 'I have a high regard for metaphor. It is how we come to understand the world.' Some literal-minded individuals have interpreted this as meaning that I don't believe in the scientific validity of my own hypothesis. It will hardly surprise you to learn that I do. I wouldn't have spent a large chunk of my life on the scientific data and evaluating my hypothesis against it if I didn't. It's just that I also understand that metaphor is not opposed to truth, but the basis of all meaning, including – and even particularly, as philosophers George Lakoff and Mark Johnson claim – in science and philosophy.

As far as the second issue goes, the dependability of the science research on which I rely, no-one can avoid this nagging question. Yet science would be brought to a standstill by too great an insistence on dependability. The best security comes from drawing on as large, as broad-ranging, and as representative a base of evidence as one can. Wherever possible – and clearly that can't always be the case – one should try to ensure that assumptions are based on studies of different types, employing more than one method of approach (thus minimising the chances that the findings are all vulnerable to the distortions inherent in one methodology); on studies coming from more than one era (thus minimising the chances that the findings are influenced by fashion); in the case of a neuroscience hypothesis, not solely on the results of scanning studies (which are more prone to distortion and problems of interpretation than any other methodology); and, in the case of a human neuroscience hypothesis, on findings that are consonant, if at all possible, with those in animals, where relevant. This is a counsel of perfection, but I have tried as far as possible to follow these principles.¹³⁹ And I have been very lucky: I have had what is these days, alas, the luxury of not being forced to crystallise my thinking prematurely, and of being able to gather evidence on a large scale over long periods of solitary time.

I also think it more likely that one is on the right track if one's findings precipitate a coherent and integrated *Gestalt*. On this last point, it seems to me one of the strengths of the hemisphere hypothesis that it makes sense not in a piecemeal way, but as a whole synthetic project, proposing coherent experiential worlds, not just a randomly assorted set of findings. The test will be how well it answers to, and helps make sense of, the further findings we make over time and our lived experience. A working hypothesis, in other words. And, as von Neumann suggests, we can't know more in the way of scientific truth than that our hypothesis works. The hemisphere hypothesis is inevitably provisional, and with luck my provisional thoughts may be useful to others.

Nonetheless, what I am engaged in, here and in the next few chapters, may seem paradoxical. I am, as you know, not as troubled by that as others may be: it may be a sign that I am on the right path. But it is odd that it falls to someone whose argument depends on reason and scientific evidence to be the one to point out the limitations in both. However, my aim is to make both of these paths to certain kinds of truth the stronger, by clearing them of

false conceptions which only leave them open to misunderstanding, and to some extent, therefore, to the erosion of the respect which is their proper due. And to set them in a proper relationship, and harmony, with other possible paths to truth.

An attempt to restore balance is a thankless task. My reward for this may be that I will be seen by some as attacking science or reason; and be seen as offering comfort to those with whom I deeply disagree in their disregard and disrespect for the values that science and reason at their best uphold. By others I will be seen as a reductionist for placing as much emphasis as I do on the value of science and reason in helping us understand our all too human predicament. But those who insist on seeing what I say in a perverse light I cannot help: they won't want their prejudices to be disturbed.

Let me never be adduced in evidence against science. Science is, or should be, a source of wonder that opens out our understanding of the world and gives us one of the touchstones on the path towards truth. Just because science cannot answer all our questions does not mean that it is not the very best way to answer some of them, and a helpful contributor to answering many more. And that there is corrupt practice in science does not make it different from any other human enterprise. Anyone that is misguided enough to reject science must have a very limited imagination, as well as being blind to many beautiful truths, and will make many errors. But the same is true of anyone who accepts only science. For it can also become a tool that banishes wonder, stunts imagination and narrows down understanding, before closing the mind altogether. That is, however, what bad science does: it is not intrinsic to science. To see the limits of science empowers it; to see no limits to it strikes at the very heart of the enterprise.

I believe some of the political difficulties we are now experiencing in the Western world come from a lack of balance, in which wilful blindness to the problems in one's own position eventually causes an ignorant and extreme reaction, when those who are at some level all too aware of what is being ignored and denied can finally contain themselves no longer. Those liberal intellectuals who had their doubts about the Western liberal intellectual consensus of the last few decades were stigmatised for not having unlimited enthusiasm. Those who criticised the consensus liberal position for its excessive one-sidedness, before it was too late, were seen as enemies: they were in fact friends. 'Plato is my friend, but a greater friend

is Truth', as Aristotle is said to have remarked; falsely, as it happens – but such is life. [140](#)

REASON & TRUTH

REASON'S CLAIMS ON TRUTH

Reason is the special embodiment in us of the disciplined counter-agency which saves the world.

—*Alfred North Whitehead*¹

The pride with which some artists announce that they cannot think logically reflects an attitude complementary to, and as dangerous as, the view that one needs only to be able to think logically.

—*Jan Zwicky*²

It is equally excessive to shut reason out and to let nothing else in.

—*Blaise Pascal*³

IN THIS CHAPTER, AND THE NEXT, I EXAMINE WHAT THE HEMISPHERES CAN tell us about the use of reason as a guide to ultimate truth.

Heidegger said: ‘We may venture the step back out of philosophy into the thinking of Being as soon as we have grown familiar with the provenance of thinking.’⁴ What, then, is the ‘provenance’ of thinking? To question the provenance of something is to ask where it comes from, and whether we should take its claims at face value – as in the ‘provenance’ of a drawing attributed to Leonardo.

So what is reason?

Reason, wrote Whitehead, is ‘the discipline of shrewdness’. And he went on: ‘Reason which is speculative questions the methods, refusing to let them rest.’⁵ It is, in other words, a critical discipline, more than a creative faculty, questioning our ways of thinking and keeping us from complacency, its first target being our ‘methods’ – which include itself. Arguably it is the widespread philosophical failure of science to question its methods that has led to the problem of scientism.

And what are reason’s methods?

Reason suggests a linear way of thinking, seeking chains of causation, which makes sense only in a limited environment. Its mode of operation is local, one bit at a time.

Reason suggests a global, holistic understanding, which makes sense only in the round. It is a seamless apprehension of the world.

Yes, you read that correctly. Reason means different things – has in particular two distinct meanings. In our world, one is becoming predatory, the other disappearing like a hunted animal.

The first is what a calculating machine, otherwise known as a computer, can do. At least it can be made to look as if it does by human beings who put in the rules for linear procedures, give it material to work on and interpret the results. In its increasingly pervasive interactions with us, the machine inevitably imposes on us what a clever urban geek put into it last year, as though this were the most intelligent way of conducting human life. It doesn’t know that in humans this is a very strange way of behaving, because there is no tempering of rule-following with reason – of the second kind. That can be offered only by a living, fully feeling, embodied being, since it draws on *value*, and on the vast, complex store of human experience, reflecting an understanding of how particular cases always differ by virtue of context.

In this way the first mode of reason replicates in us something like a way of looking at the world normally found in mental illness. A kind of (itself irrational) rationalising and a neglect of reasonableness are, as we have seen, striking characteristics of both schizophrenia and autism, which tend toward an unbalanced, rigid, disembodied, procedural type of mentation, lacking in normal emotional intelligence.

The second is what gives integration to our world. It sees the big picture and sees that the details are inevitably subordinate to that bigger picture.

Whitehead saw that what had gone wrong in the Dark Ages was the loss of this integrating faculty:

It is not merely that in the earlier times the men knew less. They were intrinsically less able in moving about among general ideas. They failed to discriminate between minor peculiarities of details and the major notions. The power of going for the penetrating idea, even if it has not yet been worked into any methodology, is what constitutes the progressive force of Reason. The great Greeks had this knack to an uncanny degree. The men of the thirteenth century had it. The men of the tenth century lacked it ...⁶

And, I would claim, we largely lack it now once more.

English has, for better or worse, become the *lingua franca* of the modern world. The distinction I am making between two kinds of reason is disguised in English by its using the same word for two very different phenomena. In other languages, it is not necessarily so. In German there is a distinction between *Verstand* and *Vernunft*, in Latin between *ratio* and *intellectus*, in Greek between *dianoia* and *nous*: in the first of each case, what one might call, in the absence of anything better, *rationality*, a *linear* process; in the second, *reason*, an understanding in the *round*. I suggest that these two versions reflect the typical mode of operation, and exemplify the characteristics of, the left and right hemispheres, respectively. The first is rigid, aims for certainty, tends to 'either/or' thinking, is abstract and generalised, ignores context and aims to free itself from all that is embodied, in order to gain what it conceives to be eternal truths. The second is deeper and richer, more flexible and tentative, more modest, aware of the impossibility of certainty, open to polyvalent meaning, respecting context and embodiment, and holding that while rational processing is important, it needs to be combined with other ways of intelligently understanding the world.

The philosopher Ernest Gellner referred to

the 'mechanistic' insistence on impersonal, structural explanations ... It was Kant's merit to see that this compulsion is in us, not in

things. It was Weber's to see that it is historically a *specific kind of mind*, not human mind as such, which is subject to this compulsion.⁷

Much philosophical reasoning is of the first kind – for two thousand years in the West, between Plato and Kant, it was more or less exclusively so. Elsewhere in the world, and at other times in the West, this kind of thinking, the kind associated more with the left hemisphere than the right, has been considered of only limited use, and a potential source of misunderstanding when given too much credence. According to this point of view, not to temper it with other modes of understanding would itself be contrary to reason. The problem is, however, that once one is inside the rationalist bubble, one can no longer see any need to break out of it, let alone any way of doing so. As Stanley Fish put it, 'does reason [ie, rationality] know what it is missing?'⁸

Rationality is exclusive: reason is inclusive, balancing rationality with intuition, emotion and imagination. Emotion is not, as some Enlightenment philosophers thought, necessarily an impediment to reason, but an essential component of it. If you need a demonstration, the patient 'Elliot' reported by Antonio Damasio (referred to in Chapter 7) will serve. In his case, as a result of a tumour, 'a large component of the right frontal cortices was not functionally viable.'⁹ No longer able to intuit the value or emotional meaning of life situations, he was reduced to trying to compute rationally, as from first principles, in every case, and his life became insupportable. Not only did he take for ever to decide what to think or to do, but he reached, for an intelligent man, some very foolish conclusions.

And it is one of the messages of this book that imagination is not an impediment, but, on the contrary, a necessity for true knowledge of the world, for true understanding, and for that neglected goal of human life, wisdom.

Thus there is such a thing as reasoned truth, just as there is such a thing as scientific truth; but both are inseparable from the humanity that gives rise to them, both are provisional and uncertain. As with science, the vice is that of trying to avoid (what we call) the subjective by asserting (what we call) the objective. This presupposes that there is an 'us and them' about the world: something 'in here', trying to copy as well as it can something 'out there', and usually not doing it well. The one that is thought (on unclear

grounds) to do it best is said to be objective, and that in turn is taken to be the truth.

But it is the left hemisphere's process of apprehending the world that gives rise to the very idea of the 'subjective' and 'objective' – a false dichotomy. As I suggested in Part I, there is, rather, as disclosed by the mode of the right hemisphere, a 'betweenness' to reality; a world that comes into being for us, which, to paraphrase Wordsworth, we half perceive and half create. That doesn't mean that half is objective and half subjective, or half real and half a fantasy. It means that the coming into being of the world is, wholly and simply, an encounter, to which inevitably both parties contribute, and in which both parties are real: a something that is given *in our very experience of it*. That something is not an image, not a shadow, not a *representation* of something else. In as far as it falls short, it's because this something is only ever *partially* given – because inevitably partially *hidden*. It is like the Japanese Zen garden, Ryōan-ji, in which, from any one viewpoint, there is always at least one of the 15 stones that cannot be seen. Note that this does not imply there is something we *never* see; just that there does not exist a viewpoint from which everything can be seen at once.

To clarify, I am not saying that all I can know is a simulacrum, the relationship of which to a reality that I can never know I also can never know. I am saying that what I know is real enough, but it is only what I am able to see from where I am: a tiny portion of the whole. This differentiates a particular state (one that applies to each one of us, but somewhat differently) from the supposed deficiencies of a general state (one that applies to us all similarly). Not partially real, but really partial – or, better, wholly real and wholly partial. Not 'as is a landscape to a blind man's eye', but as is the living presence of the landscape of the Wye valley to William Wordsworth on 13 July 1798. And what that also hints at is the awesome property of great art: that when he wrote those lines he was able momentarily to transcend those individual limitations, and thereby pass on to us, his readers, the gift of seeing, for a while, what he saw.

What we see is real enough. It is not like the relationship between a child's drawing of his mother and the mother he loves, which the drawing represents; it's like the relationship between what the child knows of love, and what, if she has lived life to the full, the mother knows of love. As Whitehead puts it: 'We must reject the distinction between nature as it

really is and experiences of it which are purely psychological. Our experiences of the apparent world are nature itself.’¹⁰

It is true that we all have different experiences, but they share very much common ground. There is another ‘betweenness’, which links us to one another in intersubjectivity. Thus each individual consciousness is not fused with, but neither is it wholly separate from, that of others; nor is the world wholly separate from each consciousness. It is because of this that we are enabled to reach a balanced, rich understanding of the world, not an idiosyncratically meagre one. And for this reason it is vital that philosophy takes place in the *second person*.¹¹ This is how I believe and hope I am addressing myself to the reader. Mind you, it was why Plato thought philosophy could not be written down at all. It was always a reciprocity of minds. ‘Dealing with subjective phenomena is not the same as dealing with purely private experiences, as is often assumed’, write Varela and Shear. ‘The subjective is intrinsically open to intersubjective validation (second person interactivity)’.¹² The attempt to speak in the third person only has a surprising amount in common with the attempt to speak in the first person only. Equally there is no betweenness; there is a suspicion of grandiosity about either.

‘Bias for impartiality is as much a bias as is partisan prejudice, though it is a radically different quality of bias’, wrote John Dewey, and continued:

one can only see from a certain standpoint, but this fact does not make all standpoints of equal value. A standpoint which is nowhere in particular and from which things are not seen at a special angle is an absurdity. But one may have affection for [incline towards] a standpoint which gives a rich and ordered landscape rather than for one from which things are seen confusedly and meagrely.¹³

Dewey is not maintaining here that one just sticks to whatever point of view one happens to have. This is no charter for every partisan; on the contrary. To find the ‘richest’ view, the one that seems truest to the world as a whole, in the sense that it resonates with our experience in the richest way, the imaginative exercise of inhabiting a number of points of view is required. Seeing things from as many points of view as possible, so that we

don't see them 'meagrely', is not mere subjectivity. Nor is it falsely claimed objectivity: in different ways it is the opposite of each.

No '-ism' that is already *parti pris* can offer a 'rich and ordered landscape', because the mind that gives rise to it is closed, disregards the whole tapestry of reality in favour of just one strand, and inevitably needs to disparage those points of view it doesn't share. The rich view, by contrast, will draw from a number of standpoints and achieve a balanced synthesis.

The physicist Leo Szilard once announced to his friend Hans Bethe that he was thinking of keeping a diary:

'I don't intend to publish. I am merely going to record the facts for the information of God.'

'Don't you think God knows the facts?' Bethe asked.

'Yes', said Szilard. 'He knows the facts, but He does not know this version of the facts.'¹⁴

REASON BEYOND REASONING

Reasoning in the sense of rationality is a consistency tool, and nothing more. Its job is to tell us that if we hold *a* and *b*, and if we also believe that logical contradiction necessarily implies falsehood, then we must hold *c* as a consequence. It is an *intermediate* processor, albeit a very valuable one. It cannot ground itself, at the 'bottom' end, or give meaning to its outcome at the 'top' end. At the bottom end it must rely on axioms assumed on the basis that they are intuitively true (the word 'axiom' comes from the Greek word *axia*, meaning 'value' – in other words, reason is founded on what are in essence value judgments). Reason, like both science and, in a different way, morality, can bring a verdict into doubt only if it is grounded on something which is exempted from the doubting process. As Wittgenstein put it: 'the questions that we raise and our doubts depend on the fact that some propositions are exempt from doubt, are as it were like hinges on which those turn ... If I want the door to turn, the hinges must stay put.'¹⁵ Nor can it by itself give meaning to its results, at the 'top' end, but must rely on an intuitive grasp of a whole world in which alone they can be fully interpreted and understood.

Again, this is like the processing that a computer carries out. The computer neither understands the data that are put into it by a human consciousness at the start, nor understands the output, which equally requires a human consciousness, when the process is complete; but carries out an important task in the middle of this process. Even the rules by which logic operates, such as the 'law of non-contradiction' (that contradictory statements cannot both be true in the same sense at the same time) and 'the law of the excluded middle' (that for any proposition, either it, or its negation, must be true), have to be taken on the recommendation of intuition – and such intuition may be only partially reliable. These are choices, not laws: outside of courts there are no laws, only regularities. And these so-called laws of Aristotle were not intended as a description of how humans actually *do* think, but to suggest how a totally rational entity *might* think.

Pursuing logic will not in itself achieve understanding, which comes from living a thoughtful life. What the right hemisphere knows must be

already at least in part understood intuitively by another's mind for it to be *awakened* there. It cannot be *compelled* on that mind by a train of logic. This was a point pungently made by Samuel Johnson, replying to a 'pertinacious gentleman' who was unfortunate enough to say, 'I don't understand you, Sir'; to which Johnson replied, 'Sir, I have found you an argument; but I am not obliged to find you an understanding'.¹⁶

Even Plato, the founder of the Western dialectical tradition, thought argumentation was far from everything, as I mentioned in the Introduction. In his *Seventh Epistle*, he explained why he could not write a treatise on the nature of philosophy:

For [philosophy] does not admit of exposition like other branches of knowledge; but after much converse about the matter itself and a life lived together, suddenly a light, as it were, is kindled in one soul by a flame that leaps to it from another, and thereafter sustains itself.¹⁷

This sounds more like insight, robustly associated with the right hemisphere: the sudden dawning of a quasi-spiritual truth, in which reason, imagination and intuition together play their part in interpreting experience.

It is true that in the *Republic*, a dialogue some aspects of which are so problematic that it has been argued that it must have been intended ironically, Plato has Socrates tell us that 'we must follow the argument wherever, like a wind, it may lead us'.¹⁸ And in a similar spirit, in the *Sophist*, Plato has Theætetus say: 'I have to follow where the argument leads'.¹⁹ Though he might have wanted us to explore, for the sake of the argument, where it led, Plato would hardly have wanted us blindly to follow logic, since logic is only an 'unpacking' of what is hidden in our premisses. If our conclusions are absurd, we do well to go back and re-examine our premisses; just as, on any journey, if one finds oneself going astray, the intelligent course of action is not to persist along a path that is going nowhere, but to retrace one's steps.

Particularly when one initially has at least some reason for believing as one does, an awareness of one's own cognitive limitations might legitimately give rise to some measure of scepticism about arguments that attempt to undermine those beliefs.²⁰

So writes Princeton philosopher Thomas Kelly. This is one reason why one might want to qualify the idea of following an argument wherever it leads. Plato, it should be remembered, believed that philosophy was not just the following of procedures, but required moral qualities, including humility and a capacity for love. *Given these qualities*, reason may lead you closer to the truth; otherwise it may mislead.

But how is one to judge *when* one is going nowhere? Just because results are unexpected does not make them invalid: our cognitive faculties are one way of prising us away from cherished, but mistaken, beliefs. Just when we think we are lost, we may be about to stumble on hidden treasure. There is no single way to determine the matter. It can't be reasoned towards, because reason is exactly what we are trying to evaluate, and it can only carry on unpacking what it is given; intuition, though far from fool-proof, is probably a better guide, since it is based, at least, on all one's experience, not a single logical point, and intuition intuits the partial nature of its own understanding – a similar appreciation of its own shortcomings is harder for reason to come by.

The linear path is seductive to the left hemisphere's mindset in its directness and simplicity. But what seems like a virtue – that it does not change direction – reveals itself to be a vice. It has deep rhetorical power over Western minds, making it easier to believe not only that the direct approach is always the most rational, which it is not, and that reciprocal, contextual and feedback effects can be ignored, which they cannot, but that if something is good, twice as much of it will be twice as good, which is rarely the case, and that apparent opposites cannot coincide, which they can.

The linear path is responsible for the myth of progress. Philosophy progresses, if at all, by a process of circling one's 'object', revisiting it from different angles, often over many lifetimes. In the history of philosophy no more than the history of music should one imagine that worse only gives way to better over time. The important issues have been argued about for millennia without any firm conclusions being reached. That does not make the process pointless, of course, any more than the inevitably provisional and partial process of science renders science pointless: the journey, not the arrival, matters. It is one of Carse's infinite games. But this does suggest that we will not be getting anything from it which we can carry away, saying, 'this, then, is the truth'.

Rationality starts and finishes in intuition, which supports it like a pair of massive bookends. I agree with Jan Zwicky that ‘the ability to think analytically is as inalienably human as the capacities for love and grief ... It makes no more sense to attempt to eliminate it from human thought than it does to eliminate emotion, or desire.’²¹ But the value of reasoning itself is an intuition drawn from experience.

A note on my use of the term intuition here. Throughout I take intuition *not* to be an immediate perception of some unquestionable, timeless truths, as in the analytic tradition it has sometimes been taken to mean, but rather a matter of judgment based on the whole of experience, not just that little part of which we are conscious – deep, but not by any means infallible. Indeed, like all knowledge from whatever source, it is something always subject to correction or further refinement. A *Gestalt* is never absolute and final: its value is that it replaces one that accounts for less or takes less into account. ‘Philosophy advances’, writes Arran Gare, ‘as less perfect forms of philosophy are discarded and their valuable contents assimilated to more perfect forms. A philosophical system should be judged according to its coherence and comprehensiveness, and its capacity to surpass by including more limited philosophical stances.’²²

Moreover, rationality is dependent on intuition in a further way: we cannot justify rationality by reasoning, except by pointing to the fact that it often works, in the sense of delivering useful knowledge. Its worth, exactly like that of science, or of any philosophical approach, lies in that simple fact – that it ‘works’, in this sense – *where it does*. But how will we know where it *doesn’t* work, if we always assume, as in scientism, and ratiocentrism, that *where* it doesn’t, this can never count as evidence of the limits of the method, only of the limits of reality?

If reason sometimes gets between us and useful knowledge, why and when it does so cannot be simply reasoned towards, but again entails an appeal to the fruits of experience. So our commitment to reason is an intuitive one: our experience is that it is helpful to a certain degree in certain circumstances. Ignoring that nuance turns the matter unhelpfully black and white, to the impoverishment of our capacity to understand the world. As Whitehead put it, ‘the art of the speculative Reason consists quite as much in the transcendence of schemes as in their utilisation’.²³ We need to know when and how to use them to good effect, and yet know when to go beyond them. Reason should be our servant, never our master. Or as that

very reasonable man David Hume put it, 'reason is, and ought only to be the slave of the passions, and can never pretend to any other office than to serve and obey them.'²⁴

RATIOCENTRISM

As we saw in Chapter 8, the great advances of science and even mathematics are not typically made by reasoning, which is often filled in after the event, when the necessary accounting, the ‘paperwork’, must be seen to be done. Indeed such reasoning has been called ‘the endless paperwork of the mind’.²⁵

What philosophy absolutely depends on, and without which none of its enterprises is worth the paper it is scribbled on, is a *vision*. You can be as clever as you like at finding technical objections to the vision of another, but unless you have the courage to stand by one of your own, you are not a philosopher – just a logic-chopper. And a vision never results from following procedures. Philosophy, writes Waismann,

is not a matter of ‘clarifying thoughts’ nor of ‘the correct use of language’ nor of any other of these damned things ... At the heart of any philosophy worth the name is *vision*, and it is from there it springs and takes its visible shape ... Though to an outsider [the philosopher] appears to advance all sorts of arguments, this is not the decisive point. What is decisive is that he has seen things from a new angle of vision. Compared to that everything else is secondary. Arguments come only afterwards to lend support to what he has seen ... The substance of my remarks is that the conception of a whole philosophical view ... is never a matter of logical steps. A *Weltanschauung* like any of these or even a new approach like that of Wittgenstein is never ‘arrived at’, in particular it is not deduced, and once found it can neither be proved nor refuted by strictly logical reasoning ...²⁶

Philosophy is not, then, purely a matter of some abstract, procedural rationality. ‘Although professional philosophers nowadays are often highly skilled in matters of argument’, writes philosopher Bryan Magee, ‘it is in the nature of things that not many of them can be expected to have original insights’:

The outcome is hundreds upon hundreds of books which are well argued but have little or nothing to say that has not been said before. And because the quality of the argumentation is the only distinguished thing about them, and also the thing their readers as well as their writers are best at, it becomes the object of interest, and hence the criterion by which they and their authors are judged. In consequence, many professional philosophers and their students slide unthinkingly into proceeding as if philosophy is *about* arguments and they lose sight of the fact that it is really about insights. So when a philosopher comes along who really does have something new to contribute, he tends to be judged more by the quality of his arguments than by the quality of his insights – and if the former is unremarkable the latter may go unappreciated.²⁷

Waismann again cannot be bettered:

What is essential in philosophy is the breaking through to a *deeper insight* – which is something positive – not merely dissipation of fog and the exposure of spurious problems. Insight cannot be lodged in a theorem and it can therefore not be demonstrated ... It is dangerous in philosophy to hunt for premisses instead of just going over the ground, standing back and saying: look.'²⁸

Philosophical reasoning since Plato is believed to take its value from restraining the emotions so as to apprehend truth by abstract logical argument. Nietzsche thought he saw in Socrates a 'hypertrophy of the logical faculty'.²⁹ John Cottingham, himself a distinguished philosopher trained in the analytic tradition (and editor of the classic edition of Descartes's works), writes that

much Western philosophy has suffered from a ratiocentric bias – the notion that calm and detached rational analysis provides the unique key to understanding ourselves and our activities. At its worst, ratiocentrism involves a fantasy of command and control, as if by sufficiently careful use of reason we could gain an exhaustive understanding of the human condition.³⁰

The phrase ‘command and control’ suggests the coercive fantasy of rationality, that conclusions can be compelled on another, and is strikingly in keeping with the suggestion that it is the tool of the left hemisphere, whose *raison d’être* is control. However, ‘no philosophic argument ends with a QED’, wrote Waismann. ‘However forceful, it never forces. There is no bullying in philosophy, neither with the stick of logic nor with the stick of language.’³¹

Indeed, it has been argued by cognitive scientists Hugo Mercier and Dan Sperber not only that rationalising does not lead to better decisions, of which there is ample evidence, but that the capacity for reasoning arose in the first place not to help us arrive at truth: its purpose was to win arguments – whether right or wrong.³² The idea is not as novel as it seems: Burke observed that

almost the only pleasure that men have in judging [using their reason] better than others, consists in a sort of conscious pride and superiority, which arises from thinking rightly ... a pleasure which does not immediately result from the object which is under contemplation.’³³

If it is truth we are after, why do we choose the evidence that confirms our bias? Why does experiment show that providing people with reasons to change their minds often makes their position more entrenched?³⁴ Thomas Hobbes wrote in the seventeenth century that ‘arguments seldom work on men of wit and learning when they have once engaged themselves in a contrary opinion.’³⁵ Reason on its own is powerless. And, note, that is *not* simply because we are irrational (though at times we certainly may be). It is because, rather, we need to respond with the whole person, in the context of history and experience.

Argument depends on language of some kind. There is a peculiar bias towards language and naming in Western culture. East Asians solve problems significantly better when not obliged to express themselves in words, as often do Westerners, as we will see in Chapter 17; but for East Asians language scarcely appears to be involved in the process at all.³⁶ Speech is much less prized than silence in Japanese culture; silence is considered more conducive to thought. According to psychologists Timothy

Takemoto and Thomas Brinthaup, ‘Japanese culture, it would seem, is best described by the absence of words, including those to describe it’.³⁷ Visual thought is predominant among the Japanese and is preferred to verbal thought.³⁸ The Japanese language lacks a method for composing abstract nouns. *Xiǎng*, one of the basic words for ‘think’ in Chinese, is written with a glyph composed of the elements tree + eye + heart. The Chinese word that translates our word ‘concept’ means a simple symbolic impression from experience. The absence of theorising in Japanese and Chinese does not mean an absence of philosophy: philosophy is, or should be, the love of wisdom, to feel its call, not just the analysis of verbal propositions.³⁹



I believe the combination of scientism and ratiocentrism is making our vision narrower than it should be. I commented that, inside the bubble (which I would identify with the left hemisphere’s reality) we no longer see the limitations of our viewpoint – precisely because of its limitations. But nothing can prevent us from noticing that things are not working out the way we hoped. Whitehead again:

The main evidence that a methodology is worn out comes when progress within it no longer deals with main issues. There is a final epoch of endless wrangling over minor questions. Each methodology has its own life history.⁴⁰

A philosopher colleague alerted me to a good snapshot of analytic philosophy obsessively engaged in endless wrangling over minor questions.

In 1940, of all years, when Western civilisation was facing one of its most terrifying moral and existential crises, notes taken at Harvard on discussions over the year by Carnap, Tarski and Quine – respectively the leading Austrian, Polish and American analytic philosophers of their age – show that much of their discussion was devoted to working out what arithmetic *would have been* like had there been only a finite number of objects.

I am not saying that there is no place in academe for such speculation, far from it. But the complete failure by many leading analytic philosophers to engage even tangentially with the most pressing problems of a civilisation in crisis is strikingly reminiscent of fiddling while Rome burns. One might object that such was their training and expertise that we could not expect them to change. But that inescapably says something about the nature of twentieth-century analytic philosophy: its narrowness and its degree of abstraction from life. I am reminded of a remark by philosopher Jan Zwicky:

Thinking analytically is like going on a diet. Its aim is a healthy austerity of thought, a certain trimness of mind. But when it's carried too far, we're left only with a skeleton. Carried too far too often, we lose the sense that something is amiss when the patient exhibits no life. We come to take pride in our cases of polished bone.^{[41](#)}

What has happened to philosophy in our time? It has suffered the general fate of modern academic life, narrowness and sterility. Freeman Dyson puts it with customary clarity:

For most of the twenty-five centuries since written history began, philosophers were important ... They spoke not only to scholars but also to rulers. They had a deep influence in the practical worlds of politics and morality as well as in the intellectual worlds of science and scholarship ... Through all the vicissitudes of history, from classical Greece and China until the end of the nineteenth century, philosophers were giants playing a dominant role in the kingdom of the mind ... Compared with the giants of the past, [contemporary philosophers] are a sorry bunch of dwarfs ...^{[42](#)}

Philosophy has become, like science, narrowly specialised:

the debates have become so much the property of specialists who have devoted prodigious energy to devising the most intricate arguments and counter-arguments to support their views, that it is unlikely that anyone who did not have a professional or career motivation for putting in the requisite effort would willingly wade through the resulting conceptual treacle.⁴³

Once again these are the words of Cartesian scholar John Cottingham, not a man, one would have thought, to be daunted by conceptual treacle where strictly necessary. (It may not be a purely modern phenomenon though: I am reminded of the words of Friedrich Schlegel, that ‘there’s a certain sort of person for whom the exaltation of tedium is the first impulse to philosophy’.)⁴⁴ And Cottingham continues, in words that are reminiscent of the connexion between writing obscurely and getting published which we noted in the context of science (it’s ‘more difficult for reviewers to fault it’):

We learn our trade by writing doctoral dissertations, and few dissertations have been failed for being too technical or laborious, whereas a bold and transparently stated claim to which a counter-example can be found may lead to a thesis being referred back. Or again, if a journal submission manages to work through current technical debates in a manner so impressively complex that the referee cannot easily spot any flaws, it may get the benefit of the doubt. In the fierce jungle of competition, donning heavy armour against possible attack, however exhausting, sweaty, and hampering of movement, may be the safest survival strategy.⁴⁵

Great philosophers of the past, by contrast, he points out, took broad views:

If we look at Plato, or Aquinas, or Descartes, or Spinoza, or Hume, or Kant, what is striking is the *wide reach* of their thought – the extent to which it spans a great many of what we now think of as

distinct specialities or sub-specialities of philosophy. Plato, for example, has a philosophical world view which has implications for ethics and politics, for science and mathematics, for metaphysics and aesthetics; and the stamp of his philosophical vision can be clearly seen in his writings in all these areas ... In fact all the canonical figures just mentioned had a grand synoptic vision of the nature of the world, of the place of humankind within it, of the extent and limits of human knowledge, and of the best way for human beings to live.⁴⁶

In other words they addressed Plotinus's question, 'who are we?', as Schrödinger recommended that scientists should. The vision of the left hemisphere is of narrow scope; and its process of understanding is by taking ever smaller parts. But understanding always works in both directions, upwards and downwards at the same time, so that the higher levels must be presumed to illuminate the lower as much as the lower illuminate the higher.

'One can only become a philosopher, not be one', wrote Friedrich Schlegel. 'As soon as one thinks one is a philosopher, one stops becoming one.'⁴⁷ A philosopher is never in possession of the truth, but endlessly searching for it. In the middle of the twentieth century, the philosopher William Earle wrote an essay called 'Notes on the Death of Culture'.⁴⁸ In it he wrote trenchantly about the rise of what he called the Technical Philosopher, a figure who is engaged in 'professionalising' wisdom. Or rather, this new kind of philosopher steers clear of wisdom altogether, probably convinced that there isn't any. For this figure, the most shameful thing is to be thought 'edifying', followed closely by being thought 'muddleheaded':

all traditional philosophy was muddleheaded, had no idea of what it was doing, and did even that badly ... exactly what might be expected of a philosopher who intended to be edifying.

Instead this new philosopher is a philosophical worker, or 'researcher':

He would be delighted to teach his classes in a white laboratory coat ... His inquiries, investigations, and research will be embodied in a 'monograph', a short paper with the 'problem' clearly stated at the beginning, and at the end a summary of the 'results'. The monograph must also refer to the other 'literature' on the subject. The Technical Philosopher thus is short-winded; he has an instinctive distaste for the sprawling works of the nineteenth century, when philosophers sometimes sought a larger view of things.

Technical Philosophy is 'simply one sort of work for which one is paid. It should have no resonance beyond those hours'. Ideally, it takes place not in ordinary language: 'he has always had a fear of natural or ordinary language. Ordinary language is so obscure; words come dripping out of a sea of feelings and related meanings, and are logically unmanageable.' Ideally, it should be expressed in some form of artificial symbolism, 'which takes years of training to read with any ease'. The Technical Philosopher 'has always envied the mathematician, with his proofs and symbols.' By adopting such means

everything should be clear, and to some extent it is; but unfortunately the language is so impoverished that nothing of any importance can be said in it, and so artificial in form that error is perhaps more frequent in it than in our mother tongue.

And so the philosopher turns his glare on the 'muddleheaded' use of language by someone else. As Earle points out, this depends on the assumption that the language was not clear in its first usage, and must be made clear by the analysis. However, if it is not clear at first, how does the philosopher know he has 'clarified' it? And if it was already clear, why bother? As it has been pointed out, there is a problem with analysis: if the analysis can be substituted for whatever it analyses, it is tautologous; but if it cannot, it is false.⁴⁹

This assumption is combined with another 'fervent assumption',

that the philosopher himself is entitled only to analyse; that is, his work consists of tearing apart intellectually phrases others have put together. He analyses syntheses but he makes no synthesis himself ... To ask a Technical Philosopher for his vision of the world is to throw him into the worst of embarrassments. It is hopelessly to misunderstand what philosophy now is. The philosopher's answer will not try to supply that vision, or even recognise its absence; rather it will analyse the meaning of your question in order to show that it really has no meaning at all. It is left for others to supply the vision ...⁵⁰

And Earle concludes:

Now this was not always so. For the longest stretch of its history, philosophy was, embarrassing as it is to Technical Philosophy, concerned precisely with large visions and the edifying. That is, it was concerned with the human situation and what was to be done about it ... The new philosopher need know in his professional capacity *absolutely nothing* except how *words* are used ... In any event, pure knowledge has nothing to do here; it seeks absolute purity, absolute independence, and absolute irrelevance to anything anyone might conceivably be interested in. Thus has a noble discipline committed suicide.

The separation of epistemology from ethics, which arguably began with Descartes, and the prioritising of epistemology over ethics, says the philosopher David Levin, contributed to the 'acceptability of a mode of perception the character of which is grasping, possessive, and dominating. The earlier mode, more responsive, more receptive, more predisposed to be moved by ethical factors, consequently withdrew to a reduced role in our cultural life.'⁵¹ In this way the analytic frame of mind has led, as it has in science, to a fragmentation of vision, including the vision of a society. Philosophy, as Whitehead saw, is the 'very foundation of thought and of life. The sort of ideas we attend to, and the sort of ideas which we push into the negligible background, govern our hopes, our fears, our control of behaviour. As we think, we live. This is why the assemblage of philosophic

ideas is more than a specialist study. It moulds our type of civilization'.⁵² The importance of philosophy, if it is to mean anything, must lie far beyond the seminar room.

This vision – or lack of it – is what the left hemisphere's procedures lead us to. As a result, as Ernst Cassirer put it, we have amassed a huge, and ever increasing body of facts, but

unless we succeed in finding a clue of Ariadne to lead us out of this labyrinth, we can have no real insight into the general character of human culture; we shall remain lost in a mass of disconnected and disintegrated data which seem to lack all conceptual unity.⁵³

The ever-growing number of fragmented, specialist disciplines which deal with the nature of humanity, do more to obfuscate than reveal. As a result, as Scheler thought, 'one can say that in no historical era has the human being become so much of a problem to himself as in ours.'⁵⁴ An explosion of knowledge leads us only to what Bohm called 'endarkenment'.⁵⁵

Like spiritual exploration, philosophical exploration shows the fly the way out of the bottle. This is a form of enlightenment and is referred to (with deliberate paradoxical intent) as 'beginner's mind' in the Zen tradition: the freshness of insight before intellectualising dimmed it. At the end of his career, Husserl admitted that 'the first result of reflection is to bring us back into the presence of the world as we lived it before our reflection began (*Lebenswelt*)'.⁵⁶

Reality is rich and complex, and I have suggested that part of it is always hidden from us. This is not just my take: it was, in different ways what Bacon meant when he said that 'the subtlety of Nature is greater many times over than the subtlety of the senses and understanding', what Heraclitus meant by saying that 'Nature loves to hide', what Einstein meant by 'Nature hides her secrets', and what Heidegger meant by 'the clearing in which Being stands is itself at the same time concealment'.⁵⁷ To quote Cottingham again:

the way each of us makes sense of who we are and our relation to the world is a fearsomely complex process of which our

intellectualising is only the thinnest of surfaces. At the very least this suggests the need for a certain humility about the philosophical project of ‘making sense of ourselves and our activities’. We need to recognise the limitations of intellectual analysis, and the way in which insight is achieved not just by the controlling intellect, fussily classifying and cataloguing the pieces of the jigsaw, but by a process of *attunement*, whereby we allow different levels of understanding and awareness to coalesce, until a picture of the whole begins to emerge.⁵⁸

Analysis makes explicit what we are aware of in the first instance through intuition. At its best, it achieves a ‘fit’, whereby our intuitions get to be nudged and in turn our reason allows itself to be modified, somewhat like the process of attunement envisaged by Cottingham. Ultimately the result is that we trade off some of our intuitions against others.

An admirable process leading to an admirable achievement – but it carries risks. In making things explicit, one enters a labyrinth of ever-receding definitions, each one supposedly to be refined at the next turn in the labyrinth, a process which in reality is never to be completed. Consciousness, for example, let us say with Descartes, is a ‘thinking thing’, *res cogitans*. Well, I’m glad we got that clear. But what is thinking? And what is a thing? Unless the answers already include the possibility of human consciousness as we understand it, they fail. To understand these elements, ‘thinking’ and ‘thing’, they need once more to ascend, as well as to descend, the ladder of explanation. Something at a lower level of analysis does not account for, but merely re-describes, the phenomenon in which we are interested, often less helpfully. We understand human meaning by seeing what it constitutes, not just that of which it is constituted.

And this is not so much because humans are different from inanimate systems – indeed they are, but that is not the key point at issue. It is that the scientific process of breaking things down *never* offered an understanding of what something actually *is*, even if inanimate. It was only an understanding of its mechanism, and a partial one at that – a very different matter. Defining, and ever refining the definition, will never answer human questions. It is not uncommon, writes Cottingham,

for a philosopher to say he has produced a ‘theory’ of pleasure, or a ‘theory’ of action, when all that is being offered is an extended definitional and conceptual discussion. It is very easy to be caught up in the intricacies of analysis, and to mistake the introduction of more and more technical terms for a substantive explanatory advance ... What is needed is not philosophical analysis but philosophical *synthesis* – not chopping things into parts, but linking them together.⁵⁹

In most areas of philosophy we need both: but analysis must be in the service of synthesis, the left hemisphere in service of the right. On this topic, there is a subtle observation by the astrophysicist and mathematician Sir Arthur Eddington. If we do not analyse at all, we do not separate distinctly enough. But if we carry analysis too far, ‘the parts become so simple that they are indistinguishable, their indistinguishability confuses them in our observational knowledge and, in a sense, undoes the separation which the analysis has effected.’⁶⁰ To take a practical and familiar example: analysing a piece of music into phrases may give information; persisting in analysis eventually yields but single notes, that individually have no meaning and therefore yield no information whatsoever. The structure of matter illustrates the same problem: there are only a small number of elementary particles (we are told), and analysis yields progressively less information as they are approached. In other words, at an intermediate level we can usefully distinguish one material aggregation from another; at a deeper level of analysis we are left with a bunch of quantum phenomena. The uniqueness of what we had seen was in the *Gestalt* which we have just destroyed. We need to know about parts only because it can help us see how the parts *relate*. Take away the relations and we are left with nothing. Similarly, the point of a narrow and detailed specialisation is to provide knowledge that can be re-integrated into an understanding of the whole. On its own it is virtually useless.

Employing analysis, which works from the outside of its object, without listening to intuition, which inhabits the matter at hand from the inside, is like looking for the power of a poem in the translation, where it cannot be found, and then when one cannot find it, denying it was there in the original.

Even if viewed merely as an agent of consensus, unbalanced rationality does not compare favourably with a less purely rationalistic, more spiritually aware exploration of the world. Compare the great traditions of the East, in which reasoning has not been the single privileged path to truth, and where there is yet remarkable consensus over space and time, with Western cultures in which it has, and where there isn't.

EXPLICIT AND IMPLICIT REASON

There are, then, two widely held and equally mistaken beliefs about reason. On the one hand, it is believed by many that, if properly followed, reason should compel all rational people to the same conclusions, and that these conclusions have ‘objective’ truth – the fallacy of ratiocentrism (a cousin to scientism). This was given concrete expression by Leibniz, in his projected ‘calculus ratiocinator’, a computer that would transform – indeed extinguish – philosophical discourse. ‘When differences arise’, he wrote,

there will be no more disputation between two philosophers than between two accountants. For it will be enough for them to take up their pens and sit down at the abacus, and say to one another (calling in a friend if they want): let’s calculate.⁶¹

On the other hand, it is believed by some that, because this very point of view is so blatantly absurd, reason is somehow discredited, and we can act as though we owed nothing to it – the reciprocal fallacy, that of postmodernism.

But it is only the extreme claims made for rationality that are discredited. There is no way we can have discourse without some reliance on rationality, never mind without reason, which is the basis of a shared culture and a civilisation. One could claim that only poetry or the paradoxical pronouncements of mystics attain what can be called truth, but that too is unbalanced: it would clearly be a very brave – many would say, foolish – person who claimed that rational discourse led us nowhere; although it would also be foolish to deny that such discourse needs to know its own limitations, and that poetry, metaphor, myth, narrative and paradox play an important role in taking us beyond its limits. I hear as often the words of Pascal the mathematician: ‘It is equally excessive to shut reason out and to let nothing else in’.⁶²

In trying to come to a better understanding of the proper use of reason, it may help to distinguish what one might call ‘explicit reason’ from ‘implicit reason’. I have emphasised that the left hemisphere seems able to deal only with what is relatively explicit, and that it is the right hemisphere

that enables us to understand implicit meaning of all kinds; but I may seem to have been making a point that is more pertinent to the arts than to science or philosophy. All the same, as I have pointed out, the paths used by scientists, mathematicians and philosophers to reach conclusions are often implicit, and are only subsequently and incidentally coupled to an explicit justification. And I suggest that explicit reasoning brings with it hazards. As Heraclitus noted, ‘an unapparent harmony is more powerful than an apparent one’.⁶³

Surely it is always right that nothing should be taken for granted? Not always so. Some things can only be experienced or understood when they are not put to analysis. This is not because analysis defeats them, but because they defeat analysis. The effect of the direct glare is to banish the penumbra of myriad delicate threads that make it what it is and connect whatever it is to what nourishes it and gives it life, like the roots of a plant or the vessels that feed the heart and which it feeds. Snatch the plant from the soil, snatch the heart from the body, and they not only die, but they can no longer be understood for what they are. The effect is to substitute something that can be analysed for something that cannot: to change the nature of what is examined.

One of the best explorations of the distinction between explicit and implicit reason was made by John Henry Newman. In a sermon delivered at Oxford University on the 29 June 1840, he offers a number of insights; in particular that implicit reason – which is a living, embodied human skill – encompasses many elements, unlike explicit reason, which is a useful, but single mechanical procedure. He describes the mind in action, as it ‘ranges to and fro, and spreads out, and advances forward’,

not unlike a clamberer on a steep cliff, who, by quick eye, prompt hand, and firm foot, ascends how he knows not himself; by personal endowments and by practice, rather than by rule, leaving no track behind him, and unable to teach another.⁶⁴

And he makes a similar point about how we become convinced of the rightness of a position:

conviction for the most part follows, not upon any one great and decisive proof or token of the point in debate, but upon a number of very minute circumstances together, which the mind is quite unable to count up and methodize in an argumentative form ...⁶⁵

He also makes a point that should be familiar in relation to the hemispheres. Reasoning is not the same as the retrospective account we give of it – an analysis which may leave important elements out:

Here, then, are two processes, distinct from each other, – the original process of reasoning, and next, the process of investigating our reasonings ... In other words, all men have a reason, but not all men can give a reason ... The exercise of analysis is not necessary to the integrity of the process analysed. The process of reasoning is complete in itself and independent. The analysis is but an account of it; it does not make the conclusion correct; it does not make the inference rational. It does not cause a given individual to reason better.⁶⁶

The right hemisphere is more involved with the living process as it happens, the left with the post-mortem dissection that occurs *once it has stopped*. The representation of reason given by retrospective analysis is bound to be only a partial account of the true reasoning process, and Newman compares the relationship to that between a portrait and the living individual it portrays:

How minute is the defect in imitation which hinders the likeness of a portrait from being successful! How easy is it to recognize who is intended by it, without allowing that really he is represented! Is it not hopeless, then, to expect that the most diligent and anxious investigation can end in more than in giving some very rude description of the living mind, and its feelings, thoughts, and reasonings ... frequently we do not recognize our sensations and ideas, when put into words ever so carefully. The representation seems out of shape and strange, and startles us, even though we know not how to find fault with it.⁶⁷

The reasons we formally adduce in moral inquiries, 'are rather specimens and symbols of the real grounds, than those grounds themselves ... hints towards, and samples of, the true reasoning';⁶⁸ and too great a focus on analysing the process of reason, Newman points out, has some unhelpful side-effects of which we are not always sufficiently aware, particularly in the area of morality and religion. This is because of

its weakening the springs of action by inquiring into them; its stimulating to controversy and strife; its substituting, in matters of duty, positive rules which need explanation for an instinctive feeling which commands the mind; its leading the mind to mistake system for truth, and to suppose that an hypothesis is real because it is consistent ... ⁶⁹

However, all such objections, he wisely concludes, important though they are, should lead us not to distrust, and certainly not to abandon, explicit rational processes, merely to use them with appropriate caution. It is hard to find such a balanced account of reason in the debates of today.

The lack of a rational understanding of the limits to reason may prove fatal. The coherence of a civilisation depends on accepting the reality and value of principles which we do not, and perhaps never can, fully understand. In all societies hitherto this has been achieved by the influence of knowledge embodied in traditions, sometimes religious, that asked for acceptance by an appeal to imagination, not to reason alone. 'The most dangerous stage in the growth of civilization', wrote Friedrich Hayek,

may well be that in which man has come to regard all these beliefs as superstitions and refuses to accept or to submit to anything which he does not rationally understand. The rationalist whose reason is not sufficient to teach him those limitations of the powers of conscious reason, and who despises all the institutions and customs which have not been consciously designed, would thus become the destroyer of the civilization built upon them. This may well prove a hurdle which man will repeatedly reach, only to be thrown back into barbarism ... ⁷⁰

Reason does in fact demonstrate its own limits, its incompleteness. However, this is so much a trade secret that the answer to Stanley Fish's question, 'Does reason know what it is missing?' is: 'very rarely, it would seem'. As he puts it,

What secular reason is missing is self-awareness. It is 'unenlightened about itself' in the sense that it has within itself no mechanism for questioning the products and conclusions of its formal, procedural entailments and experiments.⁷¹

But there exist minds that are 'enlightened' in this respect. Pascal, one of the greatest philosopher-mathematicians that ever lived, nonetheless said that 'the ultimate achievement of reason is to recognize that there is an infinity of things which surpass it. It is indeed feeble if it can't get as far as understanding that.'⁷² Kant demonstrated the limitations of reason in what are called his four 'antinomies' (or paradoxes): in each case reasoning about a fundamental aspect of reality leads equally, he claimed, to a conclusion *and* to its opposite. In the last century Kurt Gödel demonstrated definitively that every formal system is incomplete, in that each leads to conclusions that can be shown to be theorems of the system, but cannot be proven within the system. Mathematician and philosopher Greg Chaitin claims that 'an infinite number of true mathematical theorems exist that cannot be proved from any finite system of axioms'.⁷³ It is not rational to assume, without evidence, that rationality can disclose everything about the world, just because it can lead us to the disclosure of many important elements.

Equally, just because rationality can't solve many problems is not a reason to give up on it. In 1936 Alan Turing addressed the so-called 'halting problem' – whether, from the description of any computer program and an input, it is possible to determine if it will eventually come to a conclusion, or simply run for ever – by showing that a general algorithm for solving all halting problems does not exist. Of this, Chaitin writes:

No algorithm, no mathematical theory, can ever tell us which programs will halt and which will not ... This conclusion does not mean that proofs are no good, and I am certainly not against reason.

Just because some things are irreducible does not mean we should give up using reasoning.

However, of mathematics after Gödel, he concedes:

It turns out that an *infinite number* of mathematical facts are irreducible, which means no theory explains why they are true. These facts are not just computationally irreducible, they are logically irreducible. The only way to ‘prove’ such facts is to assume them directly as new axioms without using reasoning at all ... Given any finite set of axioms, we have an infinite number of truths that are unprovable in that system.

‘Irreducible principles – axioms – have always been a part of mathematics’, he continues. It’s just that there are ‘a lot more of them out there than people suspected’.⁷⁴

Of course one does not need to rely on abstruse mathematics to see the limitations of reason. Anyone who understands poetry, drama, ritual, narrative, music, painting, architecture, or the sheer beauty and majesty of the natural world – or for that matter has ever fallen in love – can see that ultimate meaning will *always* lie beyond what reason can conceive or everyday language express.

How do we best employ reason, then, in the search for truth? To insist on reason alone is deeply irrational, not to say the sign of a mental illness, and I have touched on some of the many reasons above. ‘There is nothing so conformable to reason’, wrote Pascal, speaking of the moment at which reason appreciates its own limitations, ‘as this disavowal of reason’.⁷⁵ But to abandon reason altogether is also deeply irrational. ‘Reason seems able to overthrow the deification of everything but itself,’ writes Stanley Cavell. And yet

to imagine that what is therefore required of us is a new rage of irrationality would be about as intelligent as to imagine that because heaven rejects the prideful man what it craves is a monkey. For the point of forgoing knowledge is, of course, to know.⁷⁶

So we must use our discernment as to how much, of what sort, in what way, and to what purpose. 'Where's the certainty in that?' you may say. 'Isn't it a matter of discernment which judgments we prefer?' I can only say that if you are still hoping for something certain and above human judgment, please don't let me disturb your sleep.

REASON'S PROGENY

Improvement makes strait roads; but the crooked roads without Improvement are roads of Genius.

—*William Blake*¹

Ambiguity is of the essence of human existence, and everything we live or think has always several meanings.

—*Maurice Merleau-Ponty*²

AT THE BEGINNING OF THE PREVIOUS CHAPTER I GAVE TWO CONTRADICTORY definitions of reason, one very much the product of the left hemisphere's take on the world; the other, of the right's. I argued that we need both; that the right hemisphere's broader view of the world can accommodate both but that the left hemisphere is prone to regard its version of reason, rationality, as sufficient and, as a result, produces a narrow, ratiocentric account of the world that is deeply misleading. In this chapter I want to look in more detail at reason's progeny: the pairs of twins reason begets to help us approach truth. Again, one of each pair of twins claims paternity by the left hemisphere; the other, by the right. And once again we shall be led astray if we attend only to the dominant left twin rather than see that truth is more fully apprehended if both are enlisted, but with the left twin ultimately in the service of the right.

ABSTRACTION VS EMBODIMENT

‘The history of computers is often told as a history of objects’, writes Chris Dixon. ‘In fact, it is better understood as a history of ideas, mainly ideas that emerged from mathematical logic, an obscure and cult-like discipline that first developed in the nineteenth century.’³ Earlier I made the analogy between the capabilities of apparently intelligent logic and those of the apparently unintelligent computer. If you think that is far-fetched, recall that one of the landmarks of philosophy in the last hundred-odd years was Frege’s development of his *Begriffsschrift* (or ‘concept notation’), a formal language of meaningless symbols manipulated by precise rules, exactly as a computer operates. For the first time in philosophy, truth is specified by content-free, manipulable structures *separately* from any meaning-giving context, in a fascinating rupture of the link that, in the real world, indissolubly binds form and meaning.

Music is as near an example of pure form as one might find: it does not refer outside itself. And yet its meaning is profound. Meaning arises richly and inevitably out of any *embodied* form: but it must be embodied. Only in algebra, which is disembodied, can form and meaning be separated. Frege’s ‘concept notation’ is a kind of algebra which respects logical structures, but is indifferent to meaning. This, then, is the ultimate triumph of decontextualisation and abstraction.⁴

However, that is what one might have thought of as the downside of a machine – not the upside of a person. According to two distinguished computer scientists who won the Turing Award for services to artificial intelligence, the computer necessitated a form of logic ‘purged’ of meaning – developed by the work of Frege, Whitehead and Russell –

often referred to as the ‘symbol game’ ... played with meaningless tokens according to certain purely syntactic rules. All meaning had been purged ... Thus progress [in AI] was first made by walking away from all that seemed relevant to meaning and human symbols.⁵

The left hemisphere tends to abstraction in a number of ways. One is its dependency on linguistic thought. 'As soon as I have expressed something in a word', wrote Erich Fromm,

an alienation takes place, and the full experience has already been substituted for by the word. The full experience actually exists only up to the moment when it is expressed in language. This general process of cerebration is more widespread and intense in modern culture than it probably was at any time before in history ... words more and more take the place of experience. Yet the person concerned is unaware of this. He thinks he sees something; he thinks he feels something; yet there is no experience except memory and thought. When he thinks *he* grasps reality it is only his brain-self that grasps it, while he, the whole man, his eyes, his hands, his heart, his belly, grasp nothing – in fact, *he* is not participating in the experience which he believes is *his*.⁶

The 'brain-self' versus the 'whole man' – for which one can read the left hemisphere vs the right.

As we have seen, the left hemisphere has a greater affinity for categorisation and the general than for the unique and individual, and it deals with what has been relatively disembodied and removed from context. Once again, it is clear that all these preferences involve distancing from nature and the experienced world, in which everything is unique and individual, and dwells in embodied form within a context. In this very fact, the right hemisphere is more veridical, since real and existing things are never equal. To quote Nietzsche:

Every word instantly becomes a concept precisely insofar as it is not supposed to serve as a reminder of the unique and entirely individual original experience to which it owes its origin; but rather, a word becomes a concept insofar as it simultaneously has to fit countless more or less similar cases – which means, purely and simply, cases which are never equal and thus altogether unequal. Every concept arises from the equation of unequal things. Just as it is certain that one leaf is never totally the same as another, so it is

certain that the concept “leaf” is formed by arbitrarily discarding these individual differences and by forgetting the distinguishing aspects.⁷

This doesn’t mean there is something intrinsically *wrong* with the left hemisphere’s thought processes – unless they get mistaken for reality. A map may be very helpful in orientating you in the world, and helps you to understand aspects of it better; it can help you see further, but only when what it tells you has been returned to the world in front of your eyes. If you start to believe the map is the world, you are lost.

A map gives one power to manipulate, to understand the *form*, while at the same time, and not coincidentally, distancing one from the substantial world which gives it content. General terms, according to Charles Fried,

are attempts to sweep a large set of particulars under a single conceptual rug; but it is an attempt doomed to failure. General terms have no objective correlates; they are merely compendia of particulars collected together for our convenience in terms of similarities we note for our purposes. To say that general terms have no objective reality is to say *first* that general terms do not of themselves identify the particulars subsumed under them, and *second* that therefore the process of subsumption is a value-laden process, one which refers to human goals and purposes.⁸

Conceptualising anything is a way of asking ‘what it can do for us’, says Bergson.⁹ One of the drives behind cartography was the subduing of subject peoples, or at least the acquisition of their potential mineral or material wealth. Britain’s Ordnance Survey, one of the world’s largest purveyors of detailed maps, takes its name from its original military purpose, the mapping of Scotland in the aftermath of the Jacobite rebellion of 1745, in order to make sure that any future rebellion could be more easily quelled.

In *The Scientific Outlook*, Bertrand Russell wrote:

Scientific thought [by which he meant not imaginative scientific work, but rational, linear thinking] is ... essentially power-thought –

the sort of thought, that is to say, whose purpose, conscious or unconscious, is to give power to its possessor. Now power is a causal concept, and *to obtain power over any given material one need only understand the causal laws* to which it is subject. This is an essentially abstract matter, and the more irrelevant details we can omit from our purview, the more powerful our thoughts will become.¹⁰

He then goes on to point out that the farmer who tills the field and grows the corn makes less money from his produce than the railway companies that transport it, from whom it is more remote and for whom it is relatively abstract; and that the dealer on the stock exchange, for whom it is entirely abstract, and who is as remote as one can get from it, stands to make much more than either of them. Thereby he correctly exposes one of the most unattractive aspects of capitalism; it remains, however, a curious way to recommend a style of thought.

This was a matter that particularly concerned William James. '*The intellectual life of man*', he wrote '*consists almost wholly in his substituting a conceptual order for the perceptual order in which his experience originally comes.*'¹¹ In similar vein, Kierkegaard had commented drily:

What the philosophers say about reality is often as disappointing as a sign you see in a shop window: Pressing Done Here. If you brought your clothes to be pressed, you would be fooled; for the sign is only for sale.¹²

James's philosophy could be seen as one lifelong battle on behalf of experience against the fallacies of abstraction and representation: not offering the sign for sale, but actually doing the pressing. Where Plato had elevated ideas, which he supposed to be real and eternal, and disparaged the world of experience, which he claimed to be a poor copy of perfect ideas, James aimed to redress the balance. Naturally, like all philosophers, he works a lot at the abstract level – how could he not? But it is always in the service of a fuller understanding of the phenomenal world, not, as so often happens, a *substitution for it*. He is not (nor am I) against conceptualisation. Concepts, he writes,

are precious in themselves ... apart from their original use, and confer new dignity upon our life ...so long as their original function does not get swallowed up in the admiration and lost. That function is of course to enlarge mentally our momentary experiences by *adding* to them the consequences conceived; but unfortunately, that function is not only too often forgotten by philosophers in their reasonings, but is often converted into its exact opposite, and made a means of diminishing the original experience by *denying* (implicitly or explicitly) all its features save the one specially abstracted to conceive it by.¹³

The abstractions that we create through language seem to be real and are taken by the unwary for things. Although, general, single in nature and withdrawn from the experiential world, they are always derived from particular, instantiated, complexes, not vice versa. The abstracting tendency does, as James is very ready to admit, have its uses in many cases and places; but it can be remarkably inefficient as a way of approaching or dealing with experience, and it certainly needs to be kept in check.¹⁴ For as Heisenberg warned: 'The concepts initially formed by abstraction from particular situations or experiential complexes acquire a life of their own'.¹⁵ Which of us could deny this in the world of today? 'It is not always remarked', wrote the philosopher Max Müller,

that we men have almost entirely left the sphere of purely intuitional knowledge, and that the world in which we live and move and have our being is a world of concepts; a world which we have created ourselves, and which, without us, without the spectators in the theatre, would vanish into nothing.¹⁶

Long before this, Berkeley had criticised the 'false principles ... amongst all which there is none, methinks, hath a more wide influence over the thoughts of speculative men, than this of *abstract general ideas* ...'¹⁷ Hume called this insight of Berkeley's 'one of the greatest and most valuable discoveries that has been made of late years in the republic of letters.'¹⁸ There is a clear connexion between the will to power of the left

hemisphere, and a tendency to try to make reality conform to our theory; wisdom lies in conforming one's theory as far as possible to experience.

Pronouncements emanating from management culture are the worst. The bureaucratic mind prefers nouns to verbs, abstract nouns to concrete nouns, and, in verbs, the passive to the active voice. 'Seat-belts must be worn', just as 'the beaker was placed ...' To some extent each of these preferences is aligned with the proclivities of the left hemisphere. While much of language is of course processed in the left hemisphere, there is a tendency for concrete nouns to be processed more bilaterally than abstract ones, which are predominantly (though not exclusively) processed in the left.¹⁹ Left temporal brain-damaged patients perform significantly better with concrete than abstract words, for which the left superior and middle temporal gyri and insula appear to be crucial.²⁰ And disrupting the left temporal lobe using TMS causes impairment in processing words with abstract referents, while disrupting the equivalent right temporal area interferes with processing words with concrete referents.²¹ Equally, passive constructions in languages as syntactically divergent as English and Japanese cause additional recruitment of left hemisphere regions, particularly the left inferior frontal gyrus and posterior perisylvian regions.²² Only one study found that the right inferior frontal gyrus was also involved, which the report's authors attributed to the need for 'effortful syntactical reanalysis':²³ the right hemisphere is recruited in direct proportion to the difficulty of meaning construal.²⁴

Whitehead emphasised that there was 'a right adjustment' to be observed – a proper measure and manner – in the deployment of abstraction. And he made the wise observation that abstraction, like everything else, can be valuable *up to a point*, but that too much emphasis on it starts to be more of a handicap than an asset:

the higher animals are distinguished from mere life, by their abstractions, and by their use of them. Mankind is distinguished from animal life by its emphasis on abstractions. The degeneracy of mankind is distinguished from its uprise by the dominance of chill abstractions, divorced from aesthetic content.²⁵

The word 'aesthetic' here is used in its strict sense, referring to sense perception and feeling, not just to an appreciation of beauty – though he was very far from denying the value of beauty. Whitehead, like Schelling, believed – as do I – that reality is neither undiscoverable, nor discoverable by the intellect alone, but by the whole embodied being, senses, feeling, intellect and imagination.

'The first thing the intellect does with an object', writes James – and for 'intellect' we may substitute here 'left hemisphere' – 'is to class it along with something else.' It is Procrustean: it simply chops off all that makes one individual different from another. It was this that Nietzsche meant by his saying that 'every concept arises from the equation of [what are in reality] unequal things'. ²⁶ And James continues:

But any object that is infinitely important to us and awakens our devotion feels to us also as if it must be *sui generis* and unique. Probably a crab would be filled with a sense of personal outrage if it could hear us class it without ado or apology as a crustacean, and thus dispose of it. 'I am no such thing', it would say; 'I am MYSELF, MYSELF alone'. The next thing the intellect does is to lay bare the causes in which the thing originates. Spinoza says: 'I will analyse the actions and appetites of men as if it were a question of lines, of planes, and of solids.'²⁷

One of James's greatest contributions to philosophy was to see this as one of the principal causes of derailment in our thinking. He called it 'vicious abstractionism'. What he meant by this was that we replace, without even being aware of it, something concrete and particular with something abstract and general, on the basis that it has a feature that entitles it to belong in a certain category. At that point, instead of the process of categorisation *adding* to the 'originally rich phenomenon', by associating it with other ideas, it *strips* what it has categorised:

Abstraction, functioning in this way, becomes a means of arrest far more than a means of advance in thought. It mutilates things; it creates difficulties and finds impossibilities; and more than half the trouble that metaphysicians and logicians give themselves over the

paradoxes and dialectic puzzles of the universe may, I am convinced, be traced to this relatively simple source. *The viciously privative employment of abstract characters and class names* is, I am persuaded, one of the great original sins of the rationalistic mind.²⁸

James was, of course, not alone in seeing this. His philosophical colleague Dewey thought that neglect of context was ‘the greatest single disaster which philosophic thinking can incur’.²⁹ He was surely right. To quote Aristotle, ‘law is universal but about some things it is not possible to make a universal statement which shall be correct’.³⁰ The more philosophy abstracts and generalises, the more it distances itself from a world in which all that is is unique. All our perceptions and thoughts are parts of a living, embodied organism, uniquely embedded in a place and a moment in time. In an arresting phrase, Bergson points out that ‘our concepts have been formed on the model of solids’.³¹ Given that concepts are inevitably immaterial, this may seem paradoxical. What he means is that when concepts stand in for whatever it is that exists in the world of experience, and therefore within time, they immobilise and sunder the natural flow of the entity in question: they *freeze*, so to speak, elements that are in their very essence *dynamic*, and they separate into parts the essentially inseparable. Conceptualisation is a form of congelation, freezing in time.

It may be fairly argued that it is hard to do philosophy in any other way (though both the so-called ‘Pragmatists’ and the ‘phenomenologists’ made significant attempts), but in that case we should be appropriately modest about what philosophy can achieve. ‘All philosophers suffer from the same defect’, wrote Nietzsche,

in that they start with present-day man and think that they can arrive at their goal by analysing him. Instinctively they let ‘man’ hover before them as an *æterna veritas* [timeless truth], something unchanging in all turmoil, a secure measure of things ... A lack of historical sense is the congenital defect of all philosophers ... but everything has evolved; there are no *eternal facts*, nor are there any absolute truths. Thus *historical philosophising* is necessary henceforth, and the virtue of modesty as well.³²

As usual with Nietzsche, this is an extreme statement of a much-needed contrarian point of view. While, as I am arguing, there are indeed no ‘eternal facts’ or ‘absolute truths’, there are certainly enduring realities, ones that are recurrent, too, in many different cultures, and ones on which we may yet hope to agree if we are reasonable people. ‘There is no merit’, wrote the philosopher and social anthropologist Ernest Gellner,

in the contemporary exaggeration of the valid point that experience is never pure; indeed it is not, but there are very marked and narrow limits to the extent to which it can be corrupted, and hence the reverence for experience makes an enormous and salutary difference. ³³

One ground for believing that we might agree in our experience is the fact that we share our embodied nature – which even analytic minds, however much they may dream of being brains in vats, cannot escape. As Lakoff & Johnson make clear, metaphor is not an embellishment of thought, but its very ground.³⁴ The form (metaphor) is not *added* to the thought, but is itself the stuff of thought, and takes us back to bodily experience; which is probably yet another reason why the right hemisphere is better at appreciating metaphor than the left. It understands that language is embodied.

And literally so. Language as a whole evolved out of the motion (and emotion) of the body, as I argued in *The Master and his Emissary*. Reason, too, as Lakoff and Johnson point out, originates in the body:

Reason is evolutionary, in that abstract reason builds on and makes use of forms of perceptual and motor inference present in ‘lower’ animals ... Reason is thus not an essence that separates us from other animals; rather, it places us on a continuum with them ... Reason is not completely conscious, but mostly unconscious. Reason is not purely literal, but largely metaphorical and imaginative. Reason is not dispassionate, but emotionally engaged ... Since reason is shaped by the body, it is not radically free, because the possible human conceptual systems and the possible forms of reason are limited. In addition, once we have learned a

conceptual system, it is neurally instantiated in our brains and we are not free to think just anything.³⁵

Here the word reason is being used in its broad sense; rationality, in the narrow sense, then arises out of reason, dangerously aspiring to leave its embodied nature behind.

Abstraction simplifies. For years, at least until behavioural economics came on the scene, classical economists simply assumed that we, the actors in the economy, all behaved ‘rationally’, by which they meant according to their own abstract theory. That’s to say we ‘rationally’ and single-mindedly pursue ‘utility maximisation’ (getting the most we can for ourselves) to the exclusion of any other consideration. In a more recent twist on the idea (rational expectations theory), they even assume that our beliefs about what will happen in the future are themselves determined by our ‘rational’ adherence to what their theory says will happen. It’s as if we are robots programmed to behave according to their theories. We have all seen where such theories got us. The point is that we are vastly more complex than any machine – or the mechanical model that can be erected in our place. We do not perform as the model of *homo economicus* says we should in maximising our benefit; and at least one reason is that there is more to life than maximising our benefit. We often willingly and knowingly prefer other ends, such as being kind, charitable, or creative – or having children. You can, of course, ‘factor’ these in, as rational choices that make us happy, but as you do so the definition of the word ‘rational’ slips out of control and becomes complex beyond calculation. Consider: adversity is also a part of fulfilment. Serendipity, including serendipitous mistakes, leads us where no-one foresaw. Turns of events can’t be predicted, and neither can the responses of others. Our objectives change, and are, in any case, ambiguous. Nor is there anything irrational in having incompatible desires.

Note the assumption that the failing is in humanity if we don’t fit the model, not that there is a failing in the model if it doesn’t fit humanity: the map is, it would seem, more real than the terrain.

All abstractions are only our own simplifications of something that came to us originally in the flesh and blood as perceiving, sensate, intuiting beings, enmeshed in an unfathomable network of human society and its history. ‘Abstraction’, according to John Kay, ‘is the process of turning complex problems we cannot completely describe into simpler ones that we

think we can solve. But gauging which simplification is appropriate requires judgment and experience. Our simplifications are idiosyncratic and subjective.’³⁶ And in testing certain features of human decision-making, the circumstances have to be altered and simplified to yield artificially clear objectives, divorced from any context. In doing so the model-makers ‘are substituting a problem their methods can solve for the problem we actually face’.³⁷

Rationalistic deductions apply only within the bounds of an abstract model, not in real-world situations, and thus need to be balanced by an intuitive grasp of the whole. ‘The belief that models are not just useful tools but are capable of yielding comprehensive and universal descriptions of the world blinded proponents to realities that had been staring them in the face’, wrote Kay of leading Western economists prior to the crash of 2008:

That blindness made a big contribution to our present crisis, and conditions our confused responses to it. Economists – in government agencies as well as universities – were obsessively playing *Grand Theft Auto* while the world around them was falling apart.’³⁸

Cognition arises out of emotion, not the other way round. Abstraction literally means something that has been ‘dragged away’ from the context in which it lies, as if one were able to pull the bones out of a body. And abstraction is fine – for an intermediate process. But, to be of any use, what is abstracted must live once more: it has to be returned, as if the sinews, flesh and blood were given back to the bones. As William James says:

whatever elements an act of cognition may imply besides, it at least implies the existence of a *feeling* ... Beautiful is the flight of conceptual reason through the upper air of truth. No wonder philosophers are dazzled by it still, and no wonder they look with some disdain at the low earth of feeling from which the goddess launched herself aloft. But woe to her if she return not home to its acquaintance ... every crazy wind will take her, and like a fire-balloon at night, she will go out among the stars. ³⁹

Let me take an example. In 1984, the moral philosopher Derek Parfit set out his so-called Repugnant Conclusion. He formulated it thus:

For any possible population of at least ten billion people, all with a very high quality of life, there must be some much larger imaginable population whose existence, if other things are equal, would be better even though its members have lives that are barely worth living.⁴⁰

(By ‘better’, Parfit means that the ‘total amount of happiness’ would be more.) According to the Stanford *Encyclopedia of Philosophy*, ‘as the name indicates, Parfit finds the Repugnant Conclusion unacceptable and many philosophers agree. However, it has been surprisingly difficult to find a theory that avoids the Repugnant Conclusion without implying other equally counterintuitive conclusions.’ If that is true, it suggests to me that this could well be a case where the conclusion sits in judgment on the methods used to reach it, not the methods on the conclusion. If your line of thinking leads to a conclusion that flies in the face of any kind of wisdom, it is surely worth considering that there is a flaw in the thinking.

My thoughts about this are those of an outsider, therefore inevitably naïve. However, I’d like to think that practitioners in any field might be tolerant enough to welcome an occasional view from outside. I don’t pretend, here or elsewhere, to have ‘answers’ to philosophical riddles. I can only offer a perspective, one which might provide a new way of looking at them, rooted in knowledge of the brain. And here, as often in modern academic philosophical debate, it seems to me that hemisphere balance has been lost somewhere along the line.

In the first place, there is no sacrifice of happiness involved for somebody who doesn’t exist and never will do, and therefore no need to ‘remedy’ this by bringing ‘them’ into being. Happiness is an *experience*, one that can only exist for an actual human being, and, for the non-existent human being, happiness cannot arise. The potential for ‘that person’ to have existed (or not) only means something once that person actually exists (that is, once I exist there is a meaning to the thought that I might never have existed, but until then not). ‘That person’, that ‘I’, has no referent and is unknowable, because he or she is not sitting *in potentia* in an ideal space somewhere until summoned up into daylight by the forces of life, but would

be a genuinely new, in important senses unforeseeable, entity that it makes sense to talk about only once existent.

And, by the way, such is the freshness of creation, we also can't know in advance what sort of quality of life this person might have: given the very same circumstances he or she might be content or miserable, a matter of personal disposition. Happiness is not as dependent on circumstance as utilitarian and consequentialist philosophy tends to assume. We are not the interchangeable counters of this calculus: we are not only born different, but then go on to forge, to an extent, the different persons that we become.

In the second place, you can't sum 'happineses' in order to see how much 'Happiness' with a capital H there is in the world. Happiness is not some thing you can have: brief acquaintance with life as it is lived outside the seminar room would suggest that this 'thing' doesn't exist. (It's that trick the Greeks played on us, again, by inventing abstract nouns.) Being happy is rather something you must enter into. All that exists is the mode of being of those who exist, and for them happiness is more of an adverb than a noun. There is only the quality of happiness in the way a unique individual has a life. There isn't a tank of Happiness where the ballcock rises as more and more people feed their pipes into it. And if you really can't get by without summing something, then the sum of billions upon billions ('some much larger imaginable population') of people's wretchednesses ('lives that are barely worth living') is not something that any sane person could possibly think desirable.

These thoughts work for me – which is possibly all one can hope for – no doubt not for Kant's *Denker von Gewerbe*.⁴¹ It seems to me, in sum, that it is not so much the conclusion that is 'repugnant', but the mental processes that lead to it.

Serious moral thought can never be about the right calculus – how much one should give, or how many people one should save – but about a whole change of relationship to the world. A rationally achieved 'equilibrium' position in one's relationship to the world is a bureaucratic notion, that could be enforced by an administration, without necessarily having any intention, or power, to engage the moral sense at all. Cottingham again:

Abstract, decontextualised, psychologically jejune, detached from the drama of the human journey (the journey from complacency, through suffering, toward moral and psychological growth), the

‘equilibrium’ it promises seems all too abstract and intellectualised a notion to provide a proper way of addressing the deep ethical challenges of the human condition.⁴²

His assessment is in line with that of Dewey:

Thinking takes place in a scale of degrees of distance from the urgencies of an immediate situation in which something has to be done. The greater the degree of remoteness, the greater the danger that a temporary and legitimate failure of express reference to context will be converted into a virtual denial of its place and import. Thinking is always thinking, but philosophical thinking is, upon the whole, at the extreme end of the scale of distance from the active urgency of concrete situations. It is because of this fact that neglect of context is the besetting fallacy of philosophical thought.⁴³

In the first edition of Quine’s *Philosophy of Logic*, the first page contains the remark: ‘I would say that a sentence is logically true if all sentences with its grammatical structure are true.’⁴⁴ Sixteen years later, in the second edition, that sentence had been removed. But what is intriguing is that such a sentence could ever have been written by a respected philosopher. It means that the left hemisphere’s rule-following is allowed to have the status of truth (a certain kind of truth, at least). This is exactly what the left hemisphere believes: that it is cold in tropical Ecuador, because that’s what the logical structure – though starting from a false premise – dictates. But what kind of truth is that, and why would we be right to pursue it?

PRECISION VS ACCURACY

Earlier I made a distinction between precision, which literally means cutting something off too soon, and accuracy, the literal meaning of which is to exhibit due care towards the subject of concern. Rationality, the left hemisphere's version of reason, demands we be precise, otherwise (so it believes) meaning will escape. Thus philosophy has taken to mimicking science.⁴⁵ Yet meaning is not increased – more often diminished – by the process, and all that is achieved is a lack of flexibility. There is a kind and a degree of reaching after precision, clarity and rigour which is misplaced, because its subject becomes more and more tenuous as this process continues. It ends in a kind of increasingly unrewarding pedantry, reminiscent of an anorexic's attempt to split a pea rather than swallow it. The attempt is to *over-clarify* an area that intrinsically does not permit it. 'It is the mark of an educated man', wrote Aristotle, 'to look for precision in each class of things just so far as the nature of the subject admits'.⁴⁶

Human affairs are a case in point. Knowledge of something that is by its nature not precise will *itself* have to be imprecise, if it is to be accurate. Aristotle again: 'For when the thing is indefinite the rule also is indefinite ... the decree is adapted to the facts.'⁴⁷ In the same vein, Whitehead writes:

There is a conventional view of experience, never admitted when explicitly challenged, but persistently lurking in the tacit presuppositions. This view conceives conscious experience as a clear-cut knowledge of clear-cut items with clear-cut connections with each other. This is the conception of a trim, tidy, finite experience uniformly illuminated. No notion could be further from the truth.⁴⁸

Contrary to some fashionable philosophers, and not just those of the 'Continental' tradition, I agree with Ortega y Gasset that 'in philosophy, clarity is courtesy'. We do have a duty, to ourselves and to our interlocutors, to be as clear as our subject of enquiry permits – *but not a whit more*. When we trespass further, we blunder: we substitute something petty for something great. According to Edmund Burke, 'it is the nature of all

greatness not to be exact'.⁴⁹ His point is that precision is narrow in its focus: it deracinates and simplifies to achieve its effect. It cannot accommodate what lies beyond precision. 'A clear idea', he concluded, 'is therefore another name for a little idea.'⁵⁰

No-one expressed the proper relationship between precise thinking and missing the point better than Pascal. He contrasts what he calls *les esprits fins* ('subtle spirits') with 'geometers': what makes 'geometers' incapable of subtlety, he says, is that

they do not see what is there in front of them, and, being used to the crude, cut and dried principles of geometry, and to never reasoning until they are certain of their principles, they're lost when it comes to the subtleties, where you can't lay your hands on the principles in this way. Such principles are scarcely to be seen at all; they are sensed rather than seen; it is well-nigh impossible to get anyone to understand them if they do not sense them for themselves. They are so fine and so numerous that you must have a very delicate and very acute sense to perceive them, and without for the most part being able to demonstrate them in sequence, as one would in geometry, because such principles are not to be had, and because there would be no end to such an undertaking. You've got to see it just like that, at one glance, and (at least to a degree) without going through any reasoning process. So it is rare that the geometers achieve subtlety and that subtle minds are geometric, because the geometers want to treat matters of intuition like geometric proofs, and make fools of themselves, wanting to start with definitions and then move on to principles, which is not the way to deal with this kind of reasoning. Not that the mind does not do so, but it does it implicitly, naturally, and without artifice; for it is beyond man's wit to say how, and even to intuit it belongs only to a few.⁵¹

The lust for precision comes from a need for certainty. However, knowledge not only does not imply certainty, but is actually incompatible with certainty. Certainty resides only in our concepts, not in the reality to which we apply them. There is an intrinsic tension for the philosopher between the rational pursuit of certainty and the rational desire for

knowledge. As Hegel pointed out, ‘immediacy’ (the quality of being understandable without the need for any other concept or idea) is not compatible with determinacy, and hence certainty is purchased at the expense of content: in Scruton’s phrase, paraphrasing Hegel, ‘the more certain our knowledge the less we know’.⁵² In a similar vein, Claude Lévi-Strauss wrote that:

the work of the painter, the poet or the musician, the myths and symbols of the savage, ought to be seen by us, if not as a superior form of knowledge, at least as the most fundamental, and the only kind really common to us all – knowledge of which scientific thought is merely the sharpened point: more penetrating because it has been honed on the stone of fact, but *at the price of a loss of substance* ...⁵³

The left hemisphere’s experience is precise but diminished and fragmentary, taken out of the flow of experiential life; in fact, tending towards stasis.

The harm done by precision is that it limits what we find in reality. The right hemisphere is conventionally said to have ‘coarse’ semantic coding (I am always amused by that – such a revealingly loaded word), whereas there is nothing coarse about the left hemisphere, with its ‘fine’ (another loaded word, when you think about it) semantic coding. What this means is that the left hemisphere narrows down to a highly localised network and hence to a local, usual and familiar set of associations. This is not always bad – it renders us important service in the day-to-day world. But it is a hopeless way to embark on an understanding of the complexities of reality. The right hemisphere activation is at the same time more provisional, less prepotent, than that of the left hemisphere, and more diffuse, engaging a much broader semantic field, including elements only distantly related.⁵⁴ The point to understand here is this: the *less* sharply each word’s meaning is specified, the *more* likely it is to connect to other words and concepts. Needless to say, this makes the right hemisphere invaluable in enabling us to understand a range of implications,⁵⁵ to see the overall ‘point’,⁵⁶ to understand all that is non-literal in language,⁵⁷ and to gain insight into an interrelated whole.

Words constantly shift in meaning, and it is only the ‘wobble-room’ in language that enables it to keep true to what it purports to describe. ‘Just as a good swimmer must be able to swim up-stream, so the philosopher should master the unspeakably difficult art of thinking up-speech, against the current of clichés’, wrote the philosopher Friedrich Waismann, a pupil of Wittgenstein:

Language is an instrument that must, as occasion requires, be bent to one’s purpose. To stick to language as it is can only lead to a sort of Philistinism which insists on the observance of the *cliché* and will end up with a hara-kiri of living thought ... Correctness is a useful, but a negative virtue.⁵⁸

As Bryan Magee points out, the demand that one define one’s terms in advance is not only limiting to thought, but actually illogical:

the clinging notion that if we are to have a worthwhile discussion we need first to define our terms is demonstrably self-contradictory. Every time we define a term we have to introduce at least one new term into the definition, otherwise the definition is circular. But then we are under an obligation to define our new term. And so we are launched into an infinite regress. Attempts to clarify all our terms must, and can only, result in discussions of words and meanings to which it is logically impossible there should ever be a conclusion. So discussion, if it is to take place at all, has no alternative but to make use of undefined terms.⁵⁹

The hunger for certainty leads to a quest for precision where precision is actually harmful. When dealing with complex conscious beings rather than machines, there can even be a sort of slovenliness about certainty. To quote a not uncritical obituary of Sir Leslie Stephen, the founding editor of the *Dictionary of National Biography*,

To love certainty overmuch is often to be content with too easy solutions, and definiteness may be achieved only at the price of inadequacy ... For, after all, neither literature nor life is quite sane

and orderly, and the whole truth, perhaps the most vital part of the truth, is not to be looked for in a clear and well-regulated survey. A thing may be perfect only because it is incomplete ...⁶⁰

This, too, is a point made by Waismann:

There is nothing like clear thinking to protect one from making discoveries. It is all very well to talk of clarity, but when it becomes an obsession it is liable to nip the living thought in the bud. This, I am afraid, is one of the deplorable results of logical positivism, not foreseen by its founders, but only too striking in some of its followers. Look at these people, gripped by a clarity neurosis, haunted by fear, tongue-tied, asking themselves continually, 'Oh dear, now does this make perfectly good sense?'... some of the greatest discoveries have even emerged from a sort of primordial fog. (Something to be said for the fog. For my part, I've always suspected that clarity is the last refuge of those who have nothing to say.)⁶¹

Waismann, it should be remembered, was a member of the notoriously 'rigorous' Vienna Circle, himself one of the key theorists in logical positivism, a mathematician and a physicist, and Reader in the Philosophy of Science at Oxford.

There is an important role for ambiguity (polysemy) in all understanding, something which metaphor, symbol, humour, tone of voice, and all the implicit modes of expression of the arts best understood by the right hemisphere, imply. This is not ambiguity in the sense of just not having taken proper trouble to pin down the meaning: but in the sense of having, indeed, taken proper trouble *not* to pin down the meaning too closely, so as to let it live – the proper rigour of ambiguity.⁶² Bringing an unwarranted simplicity to the matter strips away layers of depth, rather than enhancing insight.

Everything is in truth a matter of degree, and everything changes with context – all of which the 'take' of the right hemisphere accommodates better than the left. And the characteristic approach of the right hemisphere is better designed to respect uniqueness. Our ability to produce and

understand generalities was developed and directed to cope with practical requirements; it relates to our tendency to classify our surroundings in a manner that will ensure useful action. All actually existing entities, being unique, can conform only partially to the categories to which our minds consign them; and everything is what it is only within the context in which it finds itself. But the left hemisphere privileges categories in order to make general predictions; thus matters of degree, context and uniqueness are sheared away when the left hemisphere's rationality takes over from the right hemisphere's reason. The process is reminiscent of an attempt to preserve a dragonfly by squashing it into a matchbox.

The dangers of removing things from context apply not just to the more particular case of rendering explicit and precise something whose whole *existence* depends on being implicit and unstated – such as remarks that are humorous or ironic, words that are metaphorical or poetic – but to our simplest categorisations. The most everyday words require to be seen in context, and to understand them clearly they cannot be abstracted from that context.

Take something measurable, like the size of a cereal carton. We may be able to say that it is large, without having to measure it. Our decision is contextual. But, if we agree it is large, could it also be small? Apparently so. In the US there are four sizes of cereal packets: 'jumbo', which means very large; 'economy', which means large; 'family', which means medium; and finally 'large', which means small. (In other words it may be compared with either an absolute or a relative standard.)

The left hemisphere has more of an affinity for what is general than what is unique, and hence is keen to develop rules for putting things in categories where they can be managed. It does so based on the presence or absence of a single feature. But classifying is not stable when based on a single feature, precisely because it ignores context. Thus, a chihuahua is a dog, and, unsurprisingly, a skinny chihuahua is a skinny dog, and a yellow chihuahua is a yellow dog. But a tall chihuahua is not a tall dog. More interesting is the so-called 'pet fish problem'. A guppy is neither a typical pet (think dog), nor a typical fish (think salmon). But a guppy *is* a typical pet fish: here two contexts are required to overlap in order to make the statement true.⁶³

We need to categorise in order to make sense of experience. This makes experience neat and orderly – easy to deal with. Surely precision about our

categories can only help here? Since neither hemisphere can begin wholly afresh with every encounter, categorisation is not just a left hemisphere business. But it takes place differently in the two hemispheres, in keeping with their proclivities to focus on a detail or on the whole picture. This is why in the left hemisphere it tends to be carried out according to the presence or absence of a certain feature. For example, employees of a company are those on its payroll. That is nice and precise. But are the owner of the company, who acts as managing director, and the company lawyers, who are all on the payroll, employees? The distinguishing feature of birds is that they fly around; but the kiwi, that doesn't, is nonetheless a bird.

In the right hemisphere, categorisation tends to be carried out according to the degree to which the object, taken as a whole resembles an exemplar – employing what Wittgenstein called a 'family resemblance'. There is no one feature the possession of which decides the case; the secret is pattern recognition. Here it might be easier (though not always) to see that there is something else that goes to making someone an employee, and that the MD and the company lawyers don't have it; or there is something else that goes to making a bird that a kiwi does have. This hemisphere difference, providing two modes of categorisation, one precise and according to detail, the other more global and according to exemplars, must have considerable survival value, as it is also present in other species – including kiwis and guppies.⁶⁴

Sometimes the left hemisphere's precise, 'either/or', criterion is more helpful. For example, there are precise criteria for being a grandmother, namely that you are a woman whose child has become a parent. Here the exemplar of a grandmother – a wise, elderly, white-haired, woman – gets some grandmothers, certainly, but takes in some old women who never had children, and fails to identify the young fitness fanatic with long blonde hair, who has a grandchild. On the other hand, possession of a steeple, while it catches many churches, fails to catch those churches which don't have a steeple, and falsely identifies those buildings, such as a huge and bizarrely unattractive office block in West Oxford, and a parking structure at Baylor University, Texas, that do. There is no single feature to identify a church that will be as helpful as the family resemblance approach. We need both.

In terms of the law, it is usually helpful to apply left hemisphere categorisation at some points – 'for this matter to qualify as an X, it must

have a y' – but it will also be necessary to look at past cases, effectively employing the 'exemplar' approach of the right hemisphere, and be able to say, this case is more like case A, than case B, overall. The right hemisphere is more flexible, and so is this process.

It seems to me that one of the most distinctive human characteristics is that of flexibility. 'Single-mindedness is all very well in cows or baboons', wrote Aldous Huxley: 'in an animal claiming to belong to the same species as Shakespeare it is simply disgraceful'.⁶⁵ Shakespeare was, according to Coleridge, 'myriad-minded': his genius was manifest in the unpredictable freshness of his creations, who often refuse to respect the stereotype the plot demands of them.⁶⁶

To those who like regularity (literally, 'the following of rules'), another trait prominent in autism, such flexibility and originality can seem no more than inconsistency. Richard Duppa, a lawyer and draughtsman, observed drily: 'While philosophers were seeking to find a character for man to distinguish him from other animals, inconsistency ought not to have been forgotten.'⁶⁷ Whether he approved or not, I don't know: he had a good sense of humour. However you look at it, consistency has its unacknowledged dark side: 'Too much consistency is seeing situations as similar when they are, in fact, different', as John Kay puts it, and as I have tried to suggest.⁶⁸ Or, to quote Aldous Huxley again:

Too much consistency is as bad for the mind as it is for the body. Consistency is contrary to nature, contrary to life. The only completely consistent people are the dead.⁶⁹

The need for consistency and certainty drives out ambiguity. Philosophy literally means the love of wisdom; and wisdom, as the pronouncements of the Delphian oracle demonstrated, is never void of ambiguity. One of the most justly famous works of literary criticism is entitled *Seven Types of Ambiguity*: different types of ambiguity account for much of the richness and depth of literature. As its author William Empson put it, in the work of art you have something like a stew, in which the pieces of meat you recognise play a part, but 'the juice in which they are sustained must be regarded with a peculiar respect because they are all in there too, somehow, and one does not know how they are combined or held in suspension.'⁷⁰

Here we are close to what Keats, in a well-known passage in one of his letters, called ‘negative capability’:

at once it struck me what quality went to form a Man of Achievement, especially in Literature, and which Shakespeare possessed so enormously – I mean Negative Capability, that is, when a man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason.⁷¹

It is because of the complexity of truth that we need to reach down into the realm of the unconscious, not just into that tiny part of our embodied being of which we are fully conscious, and where all is clear. The painter and sculptor Braque said that ‘in art there is only one thing that matters: what cannot be explained.’⁷² It is the duty of art not to let things collapse into an illusory simplicity, but to permit them to be present as far as possible in all their complex and sometimes contradictory nature, something that can be achieved only by allowing much to remain implicit.

Clarity is a wonderful, indeed beautiful, thing, where it can be achieved without loss of truth. We cannot let ourselves off the hook of striving for it. But we need also to know the proper place to stop. Its application is limited, and on a larger scale its virtue becomes a vice; then it is no longer the agent of truth, but – somewhat paradoxically – its obfuscator. It gives us the bogus sense that we have covered the ground, whereas we have only started scratching it. As Rabindranath Tagore put it, ‘the small wisdom is like water in a glass: clear, transparent, pure. The great wisdom is like the water in the sea: dark, mysterious, impenetrable.’

It would be a mistake to think that it is just in a somewhat mystical sounding realm that precision causes problems: it can cause them in any philosophical judgment. Here I think of Whitehead once more:

The sharp-cut scientific classifications are essential for scientific method, but they are dangerous for philosophy. Such classification hides the truth that the different modes of natural existence shade off into each other.⁷³

And even at the level of everyday life, precision can be far from helpful. Since our language has relatively few colour words, there will be many shades that might be classified as 'blue' by some people, as 'green' by others, and as 'grey' by still others, without anyone being wrong. But that's not because there is no right or wrong: try calling it 'orange'. Language is neglectful of the unique. We saw that 40 million colours are discriminable by the human eye: if we had 40 million words for colours that would not be an improvement. Language relies on approximation: a language with a word for every distinguishable aspect of the world would not be a language at all. It would be like the map that is the same size as the world it maps.⁷⁴ Language always shrinks reality: the one exception to this is poetry, which absolutely depends on ambiguity to escape. Language is a gross approximation – and that's why it works. Yet there exist people who believe that only once a thing is stated in *language* can it be precise. (Well, I grant you, a map has a precision that life lacks. It's just that that precision has little to do with reality.)

The philosopher Bryan Magee writes that '*whenever* I see, all that language can do is to indicate with the utmost generality and in the broadest and crudest of terms what it is that I see':

Even something as simple and everyday as the sight of a towel dropped on to the bathroom floor is inaccessible to language – and inaccessible to it from many points of view at the same time: no words to describe the shape it has fallen into, no words to describe the degrees of shading in its colours, no words to describe the differentials of shadow in its folds, no words to describe its spatial relationships to all the other objects in the bathroom. I see all these things at once with great precision and definiteness, with clarity and certainty, and in all their complexity. I possess them all wholly and securely in direct experience, and yet I would be totally unable, as would anyone else, to put that experience into words. It is emphatically not the case, then, that 'the world is the world as we describe it', or that I 'experience it through linguistic categories that help to shape the experiences themselves', or that my 'main way of dividing things up is in language' or that my 'concept of reality is a matter of our linguistic categories'.⁷⁵

We *can* find ways of using language and figures to be more precise, but we risk conveying less by doing so. For example, being told that a certain colour is 'bluey-green', though vague, is much more informative than telling me that it has an RAL number of 5018 or a wavelength of 492nm. Similarly, telling me that a certain Thai engineer earns 25,250 baht per month is more precise, but much less helpful, than saying he or she is well-off by Thai standards, though still poor by those of the USA.

Precision may impair the content of an utterance in a number of ways. Thus I may say to a friend who is coming to dinner, 'do please bring your toothbrush' – meaning he is welcome to stay over. But if I am more precise, I enter a mire. 'Please bring your toothbrush and some toothpaste.' Worse – much worse: he may now think I am suggesting that he needs to be prompted to freshen his breath. A broad vague term, doing a lot of work, has suddenly collapsed into too narrow a specificity. I am now obliged to carry on with this process. 'Please bring your toothbrush, toothpaste and some pyjamas' avoids the imputation of bad breath to some extent, but is now in danger of being a comment on my prudishness, or his nudishness, and is getting so specific that it may seem odd that I am not requiring the addition of a hairbrush (perhaps I am implying that he can borrow mine?) or a razor.

In order to be effective, laws have to balance precision with vagueness. It might seem that the more precise the law, the better it is for those who have to obey and to enforce it. But clearly this is not always – indeed not often – the case. Let's take a very simple case. Where there is a sign stating 'no ball games in the park', a person practising archery there ought not to expect to go ahead with impunity simply because the projectile in this case is not a ball. Equally, someone playing a handheld plastic pinball game would not expect to be apprehended for playing this particular 'ball game' in the park. But to specify all proscribed projectiles, along with exceptions to the list, would be unbearably tedious, would require the environment to be even more polluted with signs, and much bigger signs at that, than it already is, and would convey much less information, because few people would have the patience to read them: the funeral of common sense.⁷⁶ The proliferation of prosperous lawyers *pari passu* with the proliferation of laws suggests that there must always be a large element of interpretation in any system, however detailed its provision.

And its very specificity would be a strong argument that anything not specifically mentioned was permissible, even if potentially lethal. The more you pursue this path, the more you are open to the burden of completeness. There will always be such items, even if only because they were invented, or the term came into parlance, after the notice was last revised (and the notices would have to be endlessly revised). And how stupid do you have to assume your reader to be? Exhaustiveness is exhausting, and exhausts the human in us. What do you assume he cannot work out for himself? The concept of an appeal to reasonableness still, just, lingers on in the courthouse, so that we expect the law to be interpreted flexibly, with a sense of proportion and, dare I say it, a proper sense of the absurd, not imposed by administering a machine-like algorithm. Soon we may not be so lucky. As Louis de Bonald saw in the first few years following the French Revolution : ‘A people that has been deprived of its customs through a desire for written laws has imposed on itself the harsh necessity of writing down everything, even its customs.’⁷⁷

Occasionally, it seems to me, we need to abide by the letter of the law, particularly where a reasonable person could have so interpreted it, and particularly where to do so gives the benefit of the doubt to a defendant; but mostly we hope that the spirit of the law may prevail over the letter.

There are borderline cases. Personal judgments are inevitable in the law, as they are in medicine, in both of which the whole experience and personality of the decider may influence judgments of what is reasonable, effective or humane. That judges differ, provided it is within an unspecifiable, though recognisable, circumscribed span, is not a matter for regret, but for acceptance, perhaps even celebration; and indeed a variety of approaches is truer to the range of views on such matters held in a society than just one, inflexible, view ever could be.

A failure to see this leads to accusations of unfairness when sentences for similar offences differ. There are calls for standardisation. But the alternative is to have inflexible sameness in every case, resulting in (justified) accusations that ‘the law is an ass’, because common sense was unable to discriminate differences in the apparently similar cases. Equally, where a health authority may choose its priorities by reference to the needs of its particular population, this leads to accusations of a ‘postcode lottery’, because services available in one area are not in another; but where it no

longer has such freedom to choose, the accusation is that central planning of healthcare ignores local needs and local preferences.

Additionally, what was considered reasonable – or offensive – 50 years ago, might not be so considered today. This is not grounds for considering that judgment cannot work, but that we clearly cannot work without judgment. These are *necessarily* vague areas. Even some that look superficially precise, and where our language is precise, may be rendered ‘open-textured’, in Waismann’s phrase, by the onward march of technology. Thus, ‘mother’ is a classically precise term; but now that a baby may be derived from the ovum of one woman, delivered from the womb of a second woman and brought up by a third, the term has become ‘porous’ to a degree that renders precision impossible, at least without some such ugly qualifier as ‘genetic’ mother, ‘birth’ mother or ‘care’ mother.

By being more precise we increase the risk of spurious inaccuracy – being perhaps trivially wrong. ‘A bunch of kids’ is more accurate than ‘seven’ if there were in fact eight. Dryden died in 1700: if I say he died at the beginning of the eighteenth century, I am right even if I am thinking of 1704, whereas if I say he died in 1701, I am less mistaken, but plain wrong. Vagueness can be importantly protective. If I tell you that a fungus you have picked is an *amanita*, you will probably not want to eat it, and will live; if, being more precise, I tell you it is *amanita caesarea*, a prized delicacy, and it is in fact *amanita phalloides*, otherwise known as deathcap, you may not.

Sometimes it is in the nature of our *knowledge of the object* that we cannot be precise, as with the 9,000,000 year-old dinosaur; and sometimes in the nature of *the object of our knowledge*, since in real life things tend to spread, blur and ramify: rivers and streams, woods and forests, hills and dales, families and communities are all like this.

We have seen already how bogus precision creeps into the ‘mismeasure’ of all things human, not always because, as Gould thought, they simply can’t be measured (though many can’t), but because norms cannot have clear cut-off points. The problem is not that we cannot measure obesity, for example; we can, at least with a non-negligible degree of accuracy. But behind our measurements lies an inevitably arbitrary, but sharp, boundary: obese or not. Therein lies the problem, or at least one of them.

CALCULATION VS JUDGMENT

Our admiration for calculation deserves scrutiny. But first let me say something about precise calculation and brain lateralisation.

There is considerable overlap between areas involved in calculation and those involved in language.⁷⁸ This is because doing arithmetic involves elements that are obviously linguistic. Being able to recite and articulate number names and ‘times tables’ involved in multiplication draws on language areas of the left hemisphere.⁷⁹ However, there are just as obviously non-linguistic elements, including the visual representation of number forms and relationships, which draw on both hemispheres.

Exact calculation shows a more left-lateralised pattern of activity than approximate calculation.⁸⁰ Approximate calculation sounds like something obviously inferior, but by ‘approximate’ calculation is meant, for example, being able to see which of two proposed answers to a problem, neither of which is precisely correct, is *closer* to being correct. This does not involve carrying out a sequence of verbalising processes according to rules, but having a ‘feel’ of what the right answer is likely to be. Even just identifying which of two numbers is the larger has been found to exhibit a right hemisphere lateralisation, as opposed to the strong left hemisphere lateralisation involved in multiplication.⁸¹ It is not perhaps surprising that understanding false versus genuine facial expressions of emotion, whether the task is deliberate or automatic, depends on the right orbitofrontal cortex and temporoparietal region.⁸² But so does number processing. In a task involving appreciating the relative value of a number

the same parietal functional asymmetry seems to underlie both automatic and intentional numerical processing with only the right, but not left, intraparietal sulcus being causally relevant for successful performance during both tasks.⁸³

There is I believe, a suggestive comparison here with hemispheric contributions to language. Most aspects of syntax, certainly syntax that is in any way complex, are far better carried out by the left hemisphere;

however, understanding ultimately what an utterance *means* is highly dependent on the right hemisphere's so-called 'pragmatics'.⁸⁴

The quantification of human variables is almost bound to entail measuring a proxy that is quite different from what it purports to be measuring, and coming up with a figure that implies a degree of precision neither the subject, nor the means of measurement, can sustain. This is not an amusing technicality: it happens every day and plagues our lives.

In an era in which measurement and monitoring apply across the board they can have a baleful effect on creativity. In September 2016, the Arts Council of England forged ahead with plans to impose a standardised system for measuring artistic quality on its 'National Portfolio Organisations'. Arts organisations themselves were understandably sceptical of a standardised approach to measuring quality in the area of creativity, not to mention the administrative burden associated with it. Despite resistance the Arts Council chugged on regardless, claiming to have developed a 'meaningful measure' of artistic quality that yielded consistent results, and providing a digital 'platform', ominously called Culture Counts, to manage the process and handle the data. You can tell how much the administrators of the Arts Council understand about art from their beautifully crafted statement that 'the trial has given us confidence that there is sufficient support within the sector to examine the quality of work in an exciting, contemporary way, enabling us to now support a wider roll out of the quality metrics'. Shelley could not have put it better; indeed he would have been rendered temporarily aphasic. One 'arts professional', whatever that is, possibly speaking for many, is reported as expressing concerns about 'reducing artistic quality to a statistic'.⁸⁵ Also to something that has to be delivered in measurable amounts within a time schedule. If that's what 'the public requires' when it comes to the spending of public money, the public needs to be educated. Wherever money comes from to support the arts, the only way that makes sense – as with research in academe – is to choose good people by judgment rather than by formula, and let them get on with it, not hover over them, brandishing a metric, and breathing down their necks.

One of my favourite lines is 'OK, the data's lousy, but it's all we've got': according to a booklet bearing this title, it is 'an actual quote, and the speaker, a full professor of economics at a reputable US university, is reasonably well known'.⁸⁶ As the booklet's author, Gerald Gill, points out,

‘it may seem obvious, but in view of what has just been said it is perhaps worth stating the obvious: *wrong data are worse than no data*’. And he quotes the biologist and historian Robert Chambers’ critique of ‘survey slavery’:

Exhausted researchers ... stare at print-outs and tables. Under pressure for ‘findings’, they take figures as facts. They have neither time nor inclination to reflect that these are aggregates of what has emerged from fallible programming of fallible punching of fallible coding of responses which are what investigators wrote down as their interpretation of their instructions as to how they were to write down what they believed respondents said to them, which was only what respondents were prepared to say to them in reply to the investigators’ rendering of their understanding of a question and the respondent’s understanding of the way they asked it; always assuming that an interview took place at all and that the answers were not more congenially compiled under a tree or in a teashop or bar, without the tiresome complication of a respondent.⁸⁷

In mathematics – at least in calculation, which is just one part of mathematics – precision may seem to be essential. For some purposes, naturally, it is: our society’s exchange mechanisms depend on precise calculation, as does engineering, and as do many elements of science. But it is quite a jump from such a utilitarian justification of calculation to the wider belief that any conclusion reached by the exercise of reason can be truly rational only through the deployment of calculation. Yet that, it seems, is a view increasingly held, explicitly or otherwise, in the contemporary world. And it involves (indeed it requires) the transposition of what the right hemisphere identifies as ‘quality’ into what the left hemisphere can manipulate as ‘quantity’ – that’s to say, the conversion of something imprecise into something precise – a number – the necessary precondition for calculation to proceed. Much harm ensues.

From the point of view of the hemisphere hypothesis, numbers are interesting in their own right. We have, alas, become used to trying to represent quality by quantity, but not to seeing that quantities, too, have quality. By this I mean three things.

First, numbers themselves have qualities – certainly the lowest numbers, from 1 to 10 do, and to a mathematician many more, such as, in particular, 37 or 1729. They differ not just in amount, but in the characteristics of the number. Each of the first numbers, 1–9, has a different role and appears in different places for different purposes throughout nature – odd numbers, like asymmetry, being particularly associated with generating newness – and has different qualities within music.⁸⁸ According to Jung,

There is something peculiar, one might even say mysterious, about numbers. They have never been entirely robbed of their numinous aura ... Unlike concepts, they are based not on any psychic conditions, but on the quality of being themselves, on a “so-ness” that cannot be expressed by an intellectual concept. Under these conditions they might easily be endowed with qualities that have still to be discovered. I must confess that I incline to the view that numbers were as much found as invented, and that in consequence they possess a relative autonomy analogous to that of the archetypes.⁸⁹

Like everything else, numbers can be approached in the typical mode of the left hemisphere, or of the right. In left hemisphere mode, they are thought of as absolute entities, abstract, of equal quality, and adynamic (the word ‘statistics’ is derived from the same root as ‘static’). In right hemisphere mode, they may be seen as dynamic relations: music and beauty arise out of the relational nature of numbers, their proportions and structures. In music this is inherent in melody, harmony and rhythm. Something as simple as changing from 4/4 time to 3/4 time changes the *quality* of the experience entirely, and of course harmony and melody are utterly changed in their meaning by altering the relationship between the notes – in which the music exists, and in which alone it exists – even by small (though not by infinitesimally small) amounts, such as a semitone or a quartertone.

In the visual world certain proportions, such as the Golden Ratio (ϕ) which is found repeatedly in nature, are experienced as intrinsically beautiful.⁹⁰ Thus the number has human meaning. The golden ratio is arrived at mathematically by taking any number you like, dividing 1 by it,

adding 1, and repeating the process an infinite number of times. Whatever number you start with, you converge on a number that is approximately 1.618, universally appreciated as aesthetically satisfying in its relation to the number one. I say ‘approximately’ because, like other important ratios we find everywhere in nature, such as π , e , and $\sqrt{2}$, it can only be approximated, never finally reached. It is said to be ‘irrational’: that is, its inherent reality can, in the nature of things, be specified only imprecisely.

Thinking again of numbers as having individual properties, the golden ratio has a relation with the number 5, since ϕ is repeated throughout the structure of a pentagon and a pentagram, but that relationship is concealed.

The idea that numbers are relational, rather than absolute, is also embodied in colours: colours have frequencies, and those whose frequencies do not ‘harmonise’ are said to ‘clash’. For Pythagoras, there was a natural harmony in the universe founded on numerical relationships, and it was expressed as the music of the spheres, a belief that the numerical proportions – the relationships – of planetary movements expressed a music inaudible to our ears, a belief that was held up to at least the time of Johannes Kepler, who wrote a treatise on the subject, *Harmonices mundi*. Shakespeare’s Lorenzo in the *Merchant of Venice* puts it thus:

There’s not the smallest orb which thou behold’st
But in his motion like an angel sings,
Still quiring to the young-eyed cherubins;
Such harmony is in immortal souls;
But whilst this muddy vesture of decay
Doth grossly close it in, we cannot hear it.

I mentioned Jedediah Buxton in Chapter 9. He was an extreme case of the apprehension of quantity dominating the apprehension of quality, and of meaning, to the point of the latter’s total obliteration. But it is only an extreme case of a much more common phenomenon in contemporary culture: the attempt to convert as much as possible of what we value qualitatively into a quantity that can be subject to an exercise in calculation and ignore, Buxton-like, anything that cannot be converted. Very often these are all the most important things.

This is the second sense in which quantification introduces qualities of its own. I have seen a 300-page report on the impact of a certain projected

development on a region of outstanding natural beauty that catalogued possible impacts on the local economy, employment, the return on investors' capital, the likely productivity of the scheme, its potential for 'recreational activities' and so on, and only on the last page acknowledged that there were 'possible impacts' on the profound beauty, peace and majesty (naturally the terms are not theirs, but mine) of the landscape, but that these were impossible to assess and had therefore not been included in the calculations. Even more striking is a report from the World Bank on the World Health Organization's onchocerciasis control programme, which saved hundreds of thousands of poor people in Africa from going blind. A cost-benefit analysis was 'inconclusive' because the people were so poor that saving their eyesight had little economic impact. 'There are humanitarian benefits associated with reducing the blindness and suffering caused by onchocerciasis', they conceded, but 'these benefits are inherently unmeasurable, and we will not account for them here.'⁹¹

Our desire to calculate leads us to invent weights and measures to 'evaluate' issues before us. But numbers can never *evaluate* anything at all, precisely because they don't deal with values. Even if you 'evaluate' something as 'profitable', the value is nowhere to be found in your measurement, which has no capacity to deal with value (although, subtly, it imports a pernicious value, that of the person who believes everything can be measured). The value is what is in the background here: your desire to make a lot of money. When we measure the worth of a person, a poem, a quartet, a painting or a landscape – or a social policy – it is not that *they* are judged by our measures, but that the appropriateness of our measures is weighed in the balance by *them*, and most often found wanting.

And then there is the third point, that quantity in and of itself changes quality. For example, we casually say 'you can't have too much of a good thing'. Yet more of a good thing – say, liberty, transparency, equality, pudding size, hang-gliding, insulation, economic growth, safety, hygiene – does not inevitably make things better: it often makes things worse. Even things we think of as bad – say, punishment, secrecy, kale salads, shame, hunger, discomfort, constraint, taxation, grief – don't get better if diminished beyond a certain point. *Quantity always changes quality*. This is so obvious that I am sorry to have to state it, but the fact remains that in public debate, the very large majority of the time, some things are just assumed to be better, the more we get, and others to be simply bad, however

much we have, and to be extirpated root and branch. If you asked people to consider whether this was realistic they would probably say ‘no’, but would then go back to behaving as if it were true. ‘Complete inability to control the response to pain is damaging’, writes John Kay, ‘but so is too much control.’⁹² For *everything* there is an optimal amount, and it is rarely if ever zero or infinity. Even what appears evil may cause some good, and what seems good cause some harm. If it is true that every devil has his angel, it is also true that every angel has his devil (see Plate 24).

Furthermore, some things cannot be expanded indefinitely without radically changing their nature. To take an obvious example, access to wild and beautiful places: once they are mass tourist destinations they are no longer wild and beautiful, so the process of expansion destroys the reason for their being desirable. No doubt controversially, I would argue that this can happen with university education: the attempt to expand it beyond a certain level begins to erode the valuable things for which it was desirable in the first place. Of course it remains an open question, for each of these issues, *at what point* we start to go down the other side of the curve, something on which reasonable people may differ, but it is a question that is insufficiently publicly discussed. It is simply assumed that there is a straight line. I shall come back to our predilection for linearity.

Ultimately, many human qualities are just not quantifiable in any but the vaguest conceivable way, yet we know exactly when, and to a large degree how greatly, we experience them: for example, beauty, anger, hunger. Asking to quantify them would be like someone hearing Othello’s great howl of rage and despair, ‘O Spartan dog, more fell than anguish, hunger or the sea!’, and responding: ‘Yes, OK – but how much more fell?’

I will have more to say about morality in due course, but since we are here talking about the drive to quantification, I wish simply to note that it surely says much about us as a society that serious moral philosophers now believe there is a calculus of morality, whereby we can tot up the costs and benefits, and come up with an answer. This is the fulfilment of Leibniz’s dream of his famous abacus, and declaration *calculemus* (‘let us calculate’). Thus we have the infamous ‘trolley’ thought experiments: would you be doing the morally superior thing if you pushed a fat man off a bridge in such a way that in landing he switched the points, and changed the course of a runaway truck, so that it would kill only one adult and two children instead of five adults?

No doubt it would be said to be in the service of our friend, objectivity. Yet one of the reasons we are captivated by great plays such as *Richard III* – to return to the Jedediah Buxton example – and novels, narratives and myths, is that they allow us to stand back: to step away from the immediacy of experience, through what I call ‘necessary distance’, and see the complexities under which all human life labours. Such distance does not alienate, but, on the contrary, enables us to see ourselves with heightened awareness, and to empathise with those who stand *for* us – and for more than us. Great dramatic performances play out, in archetypal form, the intricacies of all human relationships and human motives, the conflicting demands of many-faceted love, of friendships, family and kin, of valued work, vocation, and the urge to create, the striving to preserve dignity and pride, and the lure of beauty towards things that are perhaps exciting, dangerous, deeply fulfilling and unendurable at once – not to mention loyalties to religious conviction, to a society’s cohesion, to the need to avoid pain, and the call to confront evil, to belong to a society and to be a unique individual, to heal, to save and to give meaning to life. In short, they inculcate the practice of judgment. That something like this can be reduced to calculation is an extraordinary idea, to say the least. Here is Roger Scruton:

When Anna Karenina asks herself whether it is right to leave Karenin and to set up house with Vronsky, she is asking herself which of two courses of action would be better. But although she is making a comparative judgment, it is not one that can be resolved by a calculation. She is torn between her obligations to her husband and her child, and her love for Vronsky. Her dilemma is not detachable from its peculiar circumstances – her husband’s vindictiveness and coldness of heart, her son’s sweet devotion, Vronsky’s *Leichtsinn* and Anna’s knowledge of his faults. Dilemmas of this kind exist because we are bound to each other by obligations and attachments, and one way of being a bad person is to think they can be resolved by moral arithmetic. Suppose Anna were to reason that it is better to satisfy two healthy young people and frustrate one old one, than to satisfy one old person and frustrate two young ones, by a factor of 2.5 to 1, ergo I am leaving. What would we think, then, of her moral seriousness?⁹³

The very act of calculation here betrays a lack of awareness of what the whole experience of morality involves. In real life, *of course*, people do not make moral judgments like this, and only a very odd mind – perhaps brilliant at calculation, but otherwise incapable of understanding the richness of the normal human being's world – would think that they ought. If humans ever did, it would be the most grievous folly, one which would spell the reduction of human beings to the status of machines. Calculation works only if you strip humanity to the bone: and then it is no longer human.

More commonly what happens is that we delude ourselves when we retrospect on how we reach moral decisions, much as we are deluded when we retrospect on our motives for many actions, by the fact that when we do so consciously we engage the serial, analytic processing of the left hemisphere. The left hemisphere is a great 'confabulator', as we saw; when it doesn't know, which is much of the time, it doesn't say so: it makes something up to fill the gap. Not being aware of how the decisions were reached, it asserts confidently that we got there by the serial analytic processes it would have used if it had to set out explicitly to tackle the problem. Some professional philosophers then appear to believe this to be the case.

We do not 'work out' moral principles on the basis of utility, as the left hemisphere imagines. Except in artificially contrived situations, such as academic debate, moral decisions are not the product of deliberative calculation, but of unconscious and intuitive judgments, derived from experience and deeply bound up with our emotional sensitivity to others. But they are no less rational for that.

It is a point Waismann makes when rescuing the concept of reason from those who would restrict the term to the left hemisphere's narrower concept of rationality, the exercise of precision, calculation and deduction. 'When the judge reaches a decision', writes Waismann, 'this may be, and in fact often is, a rational result',

yet not one obtained by deduction; it does not simply follow from such-and-such: what is required is insight, judgment. Now, in arriving at a verdict, you are like a judge in this that you are not carrying out a number of formal logical steps: you have to use discernment, eg to descry the pivotal point. Considerations such as

these make us see what is already apparent in the use of 'rational', that this term has a wider range of application than what can be established deductively. To say that an argument can be rational and yet not deductive is not a sort of contradiction as it would inevitably be in the opposite case, namely, of saying that a deductive argument need not be rational. This alters the whole picture. The point to be emphasised is that *a philosopher may see an important truth and yet be unable to demonstrate it by formal proof. But the fact that his arguments are not logical does nothing to detract from their rationality.*⁹⁴

LINEARITY VS THE *GESTALT*

Calculation is just a specific case of a broader aspect of the left hemisphere's mode of reasoning, namely its attachment to linearity, building up its reasoned re-presentations of reality step by step. Waismann's point is that such a logical mode of reason isn't the only form. There is the other twin, equally rational, where 'a philosopher may see an important truth and yet be unable to demonstrate it by formal proof'. That's to say, the philosopher sees the 'important truth' as a *Gestalt*, the whole as a single totality rather than working his way to it as the end discovery of a linear, causal sequence.

An argument is not a single decontextualised event that must compel a conclusion in anyone, ever, at all. It is just one more piece of evidence to sit with, and be weighed with, many others. If it does not fit with the tendency of everything else one knows, from thinking and from the business of life, it may be wise to doubt it. Equally, there may be many truths to which one cannot climb by one thread, but only by a rope woven of many strands. There is profound wisdom in CS Peirce's remark that

philosophy ought ... to trust rather to the multitude and variety of its arguments than to the conclusiveness of any one. Its reasoning should not form a chain which is no stronger than its weakest link, but a cable whose fibres may be ever so slender, provided they are sufficiently numerous and intimately connected.⁹⁵

Moral evaluation in particular involves, or should involve, moving on from what the left hemisphere sees as a simple causal sequence, step by step, to what the right hemisphere sees as a whole narrative: how the person arrived at those particular circumstances, what was going on in his or her mind at the time, what sort of a person would think or act in that way, whether we would like to live in a world where such people form the majority – in other words, the whole human picture, not the mechanistic part picture: Anna Karenina as a troubled spirit, not a sum to be solved.

In Part I we saw that narrative is not adequately understood by the left hemisphere; and that in schizophrenia, logic has to stand in for narrative as

the factor that attempts to link complex human events, with deleterious consequences. Linear causation is the kind of sequence that the left hemisphere *does* understand. But such reasoning can lead us astray, as one particularly elegant piece of experimental evidence neatly demonstrates. Subjects were presented with two scenarios: in one a woman put poison in a friend's coffee, believing it to be sugar, and her friend died; in the other she put sugar in her friend's coffee, believing it to be poison, and the friend lived. In the normal situation subjects naturally judged the second scenario morally worse, as most of us would, because the woman was intent on murder, not the victim of a mistake. However, with the right temporoparietal junction experimentally suppressed using TMS, subjects, relying on their left hemisphere, judged the woman in the first scenario to have acted more immorally, because the friend died.⁹⁶ Here the consequentialist approach, which the left hemisphere adopts, is really to do with an excessive willingness to judge a scenario by the externally observed chain of causation. Causing death is bad: whose action was causally responsible for a death? Then that's the guilty one.

Because the left hemisphere is the hemisphere that believes it *causes* things to happen – it is the manipulator – it privileges the relationship of causation, in which one action causes another. In fact it is claimed by Nikki Marinsek and colleagues that only the left hemisphere infers causation.⁹⁷ Whether that is so or not, the important point is that the right hemisphere is reluctant to assume causation, since the whole person requires the right hemisphere's input for us to judge whether what is taken by the left hemisphere to be causative is *capable of being so construed*. This is a matter of understanding a complex picture as a whole, not just latching on to a single thread. On its own the left hemisphere is over-eager to infer causation, and will infer a causative relationship even where clearly none exists.⁹⁸ The right hemisphere, particularly right temporoparietal regions, is more important for discriminating causation from non-causation.⁹⁹ Whether the proposed causal link is purely physical, as in one ball striking another, or social, as in the fatal coffee cup, the key activations associated with the evaluation are in the right middle/inferior frontal gyrus, right inferior parietal lobule, the right supplementary motor area, and bilateral insulae; for social causal judgments, the right temporo-parietal junction is of critical importance (as the fatal cup experiment demonstrated), as it is involved in judging animacy and intentionality.¹⁰⁰ The right hemisphere's appreciation

of the *Gestalt* is more reasonable, more likely to lead to the truth; the left hemisphere's linear approach is more likely to be mistaken.

And this brings me to another paradox concerning linearity and its limitations. For a rational being it seems obvious that you need to be clear about your goal, and then find the most direct way of pursuing it. To be unclear about your goals, to waste time by not pursuing them by the most direct means possible, is clearly illogical.

Unless, that is, the process doesn't work.

'I think I'll go and meet her', said Alice, for, though the flowers were interesting enough, she felt that it would be far grander to have a talk with a real Queen. 'You can't possibly do that', said the Rose: 'I should advise you to walk the other way.' This sounded nonsense to Alice, so she said nothing, but set off at once towards the Red Queen. To her surprise, she lost sight of her in a moment, and found herself walking in at the front-door again.

To a child this is amusing and nonsensical. However, to an adult – as is invariably the case with Lewis Carroll's paradoxical manner – it reveals a deep truth about the world.

Your ultimate goal might be happiness; and there are worse goals to have. The trouble is that, with all due respect to the US constitution, happiness can't be pursued. People who pursue happiness find that it constantly eludes their grasp, like the bunch of grapes before the outstretched hand of Tantalus. Just as the harder we pursue sleep the more it evades us. Some truths are less self-evident than others (all the true ones, by the way).

There are rational goals that the rational person ought to pursue, which nonetheless can only be achieved by not pursuing them: along with sleep and happiness, these include things as diverse as wisdom, sexual performance, sympathy and being natural. The direct approach destroys its object. Similarly there are things that can be conveyed only indirectly. To recapture the depth of what is said, or in order to say anything truly new, we are always engaged in going beyond everyday language, which means being alert to what is being said *implicitly*. It is because there is so much that cannot be conveyed in any other way, because explicitness changes its nature, that we value – or should value – poetry, humour and embodied

metaphor (otherwise known as ritual) of whatever kind. They all have the same quality that, once they are made explicit or ‘explained’, they completely lose their power and their meaning. Moreover, the difficulty with defining goals and logical methods of achieving them is not *just* that they often can’t be achieved by the direct approach, but that only factors that are not only articulable, but, moreover, have already been articulated, are taken into consideration, leaving out all that is implicit and comes only from engagement with the world and experience of life.

Interestingly, much as the happiest people don’t seek happiness, the wealthiest people are not those who most ruthlessly pursue wealth.¹⁰¹ John Kay cites a number of cases of global giants, household names such as ICI, Boeing, Merck, Pfizer and Citigroup, which were once highly profitable organisations while they focussed on delivering a good product, but which nosedived as soon as the bean-counters took over, and told people to focus on the bottom line – making money. Greed doesn’t pay (although abjuring greed because it pays better to do so is to thwart oneself, since it is the attitude of mind, not a certain action or set of actions, that is both in itself to be desired and goes to create prosperity). Success in business comes, bizarrely enough, as a by-product of running a good business.

Kay might have referred to the case of Kazuo Inamori, a Buddhist priest who took over as chief executive of Japan Airlines in the second half of 2010 at the age of 77, having no experience in the industry. The next year, he returned the company to profit and led it out of bankruptcy. In 2012 he relisted it on the Tokyo stock exchange.¹⁰² His philosophy? Looking after his workers and making sure they enjoy what they do: ‘if you want eggs, take care of the hen. If you bully or kill the hen, it’s not going to work.’ In case you think Japan Airlines was a one-off, Inamori started two companies of his own, the combined market value of which was \$82 billion by 2015.

The problems for the rational mind begin with defining goals. Aims are complex and not infrequently incommensurable – even incompatible, if we are entirely honest. As Kay points out, goals need, in any case, to be flexible, responding to changing circumstances; and these in turn vary depending on *how*, and *why*, we pursue such goals. Since the world is, to all intents and purposes, infinitely complex in its structure, we could not predict it, even if there were no ‘black swan’ events, as Nobel Prize-winning economists have found out, with limited capacity to rescue face from egg.

Some uncertainties are irresoluble, and we do well to recognise our limitations, since it makes for better decision-making. We need to be responsive to each step of the process. If you watch an animal – even an animalcule, such as an amoeba – exploring its environment, you will see it make forays, withdraw and adapt, try again in another direction, withdraw, and then find a direction it is prepared to pursue. Trial and error. Good decision-makers are eclectic and not wedded to ‘consistency’. But when things turn out, for whatever reasons, the way we thought they might, we tend to overestimate *our* role in their doing so. We overestimate our ability to predict and to control. That way disaster often ensues.

An algorithm as a replacement for an embodied skill is one case of an insufficiently flexible path, a concatenation of steps that aims to achieve a reliable goal. At its best, and if the poor performers at whom they are targeted were likely to follow them, they would avoid some poor outcomes. But they would ensure others. They are generalisations, and every case needs to be evaluated on its merits. Even if they were sufficiently reliable to cover most cases, they would eventuate in mediocrity. Dreyfus and Dreyfus outlined the difference between embodied skill and an algorithm, the skill being something that is so much part of an expert through experience that the skilled practitioner is barely aware of his or her own knowledge.¹⁰³ They distinguish five levels of skilfulness, beginning with the novice and working up to the person with judgment informed by a lifetime’s experience. The detail of these levels is not important, but their conclusion is. In the first three levels of skill acquisition, algorithms are overall more helpful than not: in the highest two they actually impede excellence. You shouldn’t break the rules until the rules have become second nature – but then you *must* sometimes break the rules if you are to be successful and excel at what you do. Skilled pilots, surgeons, or commanders can often offer little insight, after having skilfully handled a crisis, into how they thought, or why they did what they did. Most often they say, ‘I just did what I had to’. Once questioned, they offer *post hoc* rationalisations, if anything at all.

As Kay puts it,

solving equations of motion is a means of understanding how well-judged shots find the goal, but it is not a means of making it happen ... People spend inordinate amounts of time asking experts like

Beckham what is the secret of their success. They don't come away much the wiser.¹⁰⁴

In politics, coming up with a list of clearly defined ends and then looking for the technical means of realising them most efficiently ignores the complexity, the many-strandedness, the non-absolute nature, of all ideals, of all knowledge, of all experience. The best of what we glean from experience is not technical in nature; and the kinds of knowledge it affords can be articulated only with great difficulty and subtlety, and are the first kinds to be ignored in articulation. They are acquired, honoured and transmitted only through our participation in a community extending over time in which we are immersed, and from which we take our very identity as individuals, our distinctness, even our capacity for intelligent opposition to received wisdom – what is called a tradition.

Beyond all such considerations, many rational and desirable goals are simply incompatible with the state of mind required to pursue them: they must come, if they come at all, as the by-products of a life well lived. Among these are humility, courage, love, admiration, faith and understanding. As the philosopher Jon Elster points out, in his brilliant book *Sour Grapes* (subtitled *Studies in the Subversion of Rationality*), trying to bring about such states directly is a moral fallacy. The corresponding intellectual fallacy is the attribution of such states, when they occur, to intentional action.

It's not just that linear thinking may be unproductive, even self-defeating, when applied to the setting and pursuit of goals. It's that, more generally, linear thinking may not get us past first base: instant apprehension of a *Gestalt* is our only chance to understand certain things. 'Some things are such that if you do not understand them immediately, you never will', wrote Mme de Sévigné.¹⁰⁵ This insight, too, is something you must already have – if not, I cannot help you. An understanding can never be given to another; it has to be awoken within them, and so must be there, in latent form already. Reasoning about it, evaluating it, and then deciding to acquire it will lead you nowhere. This thought lies behind many insights of the Oriental wisdom tradition. Thus, in the *Chuang Tzu* it is written: 'if you have not already got it in you, you cannot receive it'.¹⁰⁶ And in Zen Buddhism,

the belief that there is a doctrine to be known appears to be a sign that one has not yet understood anything (the misunderstanding, however, may be indispensable for ultimate understanding).¹⁰⁷

Zen masters do, after all, take on pupils. The point that one has to operate in a paradoxical way – pretending there is something to know, in order that others may discover in themselves that there is nothing to *know*, and thus gain true knowledge – is an example of how one has to think on many levels, not just one. There are different kinds of knowledge involved here, as there are different kinds of innocence. There is an innocence of the inexperienced, that of the child, and there is an innocence that lies on the other side of experience – one that is rarely achieved, that of the sage. Similarly, the knowing that there is nothing to know cannot be simply achieved at this moment, by a cognitive act, while you read the sentence. You must labour to know, meanwhile hoping that unknowing may come to you. It is as far from ignorance as can be.

I spoke of Carse's finite games that are played for the sake of winning, and his infinite games that are played for the sake of the game. Yet here, too, there are levels. The infinite game must involve, at one level, and to a certain degree, a desire to win, otherwise the game will not be satisfying *even if played for its own sake*. A game of tennis in which neither party (or only one) has the slightest intent to compete, at some level, will not be a game that satisfies at the higher level, at which competition is, quite genuinely, not the point.

I mention this to draw attention to the idea that what often looks paradoxical does so because the different levels of understanding have been flattened out. Just because at one level we don't want to win doesn't rule out that, on another level, we do – at least to some extent. Thinking of them as on the same level, makes us want to do a sum: 'how much you want to win' plus 'how much you don't', so that the oppositional element will be cancelled out (as +3 and -4 can be summed to a single quantity, with a single sign: -1, as though one just didn't care much at all). But it doesn't take into account that sometimes one wants or admires two entirely contradictory things passionately without being certifiably mad. Both must be retained *at the same time* – on different levels. Not just in different compartments on the same level, but on different levels: the point is important.

Although paradox can fruitfully be thought of as the two ends of a dipole, another way of expressing the coming together of opposites is not in terms of a straight line, but of a curve, prolonging each end until one comes 'full circle'. However, it may be not so much a case of coming full circle as 'full spiral', so to speak. *Not* that when you go far enough in one direction you arrive precisely where you started from, but that you arrive at a position superimposed on that from which you started, at the next turn of the spiral. This is why Eliot says, truly, that over a lifetime one keeps arriving at a fresh understanding of what seems to be the same imponderables, the same words, the same set of circumstances, images or ideas: 'And the end of all our exploring / Will be to arrive where we started / And know the place for the first time.'¹⁰⁸ According to the literal interpretation of the left hemisphere, to arrive back where you started is to have gone nowhere. But in seeing something we thought we knew afresh, it becomes both familiar and strange: we not only recognise it, but re-cognise it.

'Where would the difference be between great art and pure fancy?', wrote Bergson. 'If we reflect deeply upon what we feel as we look at a Turner or a Corot, we shall find that, if we accept them and admire them, it is because we had already perceived something of what they show us. But we had perceived without seeing.'¹⁰⁹ It seems to me that good philosophy is of this kind: that the mind is awakened to something it feels it always knew but never saw. This is what Plato called an un-forgetting: *anamnesis*.

We appear to ascend a spiral, like a staircase from which we can look down on our former vantage point. Very few writers have written more interestingly, and none more eloquently, of the coming together of opposites than William Blake. Even the titles of some of his most famous books of poems – the *Songs of Innocence and Experience*, *The Marriage of Heaven and Hell* – speak of this insight into the dipolar nature of reality. Jacob's Ladder, the staircase that leads from earth to heaven, is an image of spiritual progress. All the depictions of Jacob's Ladder I have ever seen show a straight staircase leading into the heavens – except Blake's, which moves very beautifully in a spiral. As we ascend we see how we thought we had the truth when we didn't, lower on the staircase, and how the staircase winds upwards as far as we can see (see Plate 14).

Many situations that we have been trained to think of two-dimensionally as a linear sequence are more like a sphere, or a three-dimensional net: not linear and flat, but round and having depth. The four

fundamental forces in physics all work like this, as 3-D fields, or flows, not as 2-D lines or chains. Human societies are like spheres, too – as in any complex system, there are many re-entrant loops. The idea of a sequence of causative steps breaks down, since nothing alters another thing without itself being altered; and, as I suggest, there are no wholly separate ‘things’ in any case.

But I have not yet tackled the real problem with linearity, which is the difference between a causal chain and a flow. This is what the historian of mathematics Morris Kline called the ‘difficulty that preoccupied all the Greeks, namely, the relation of the discrete to the continuous’.¹¹⁰ It is relevant here, as everywhere, but I need to postpone examination of this crucial distinction to the next chapter. There is ground to prepare.

We often imagine that science, philosophy and understanding of all kinds progresses by adding new bricks to the path that the seeker after understanding must tread. But it is not so. Instead, a new picture comes into focus, as things ‘fall into place’: a new *Gestalt* is revealed, which ‘answers’ better to the whole of one’s experience, accommodating a richer array of meanings, than the one it replaced. The spiral accommodates simultaneously a direction and a circular motion, at each point along its trajectory offering a new vision in the round, not just the blinkered vision of the forward running line, locked to its already conceived target. In the end, it is a matter not just of cognition, but of re-cognition. The ‘re-’ here functions not to indicate just sameness but also change, as it does in re-design, re-align: it is, as Jan Zwicky points out, a *Gestalt* shift.¹¹¹

The remarks of the great German mathematician and physicist Hermann Weyl are interesting in this regard. Weyl contrasted algebraic (linear) thinking with topological (figural) thinking, suggesting that we need to be able to draw on both, but that, of the two, algebraic thinking is relatively blind. He wrote:

We are not very pleased when we are forced to accept a mathematical truth by virtue of a complicated chain of formal conclusions and computations [left hemisphere fashion], which we traverse blindly, link by link, feeling our way by touch. We want first an overview of the aim and of the road; we want to understand the *idea* of the proof, the deeper context [right hemisphere fashion] ...¹¹²

We need both – that is the point. It's just that, as Weyl makes clear, though they are both valuable, one sees more deeply than the other.

According to his obituary by Freeman Dyson, Weyl 'alone could stand comparison with the last great universal mathematicians of the nineteenth century, Hilbert and Poincaré. So long as he was alive, he embodied a living contact between the main lines of advance in pure mathematics and in theoretical physics. Now he is dead the contact is broken'.¹¹³ Weyl had the simultaneous breadth and depth of vision that enabled him to tie together an insight into *different types* of mathematical and scientific thought with truth and beauty. 'My work', Weyl said, 'always tried to unite the true with the beautiful; but when I had to choose one or the other, I usually chose the beautiful.'¹¹⁴ Although initially some of his work in physics was rejected, on the basis that it seemed to conflict with the experimental results then available, the subsequent formulation of quantum mechanics led to an acceptance of the important truth of Weyl's work. Thus, as in the case of Schrödinger, before the full scientific facts were known, the sheer beauty of Weyl's work anticipated its truth.

But it is the differentiation between what are clearly left hemisphere and right hemisphere strategies, and their relation with beauty, that is so striking: 'A modern mathematical proof is not very different from a modern machine, or a modern test setup: the simple fundamental principles are hidden and almost invisible under a mass of technical details.'¹¹⁵ His observation clearly applies to a change in the scientific literature with which I am most familiar, that of neuropsychology, over the last 30 years or so. Papers which were lucid and beautiful, and full of humanity (particularly if one goes back as far as the early to mid-twentieth century French and German literature) have yielded to something like a machine process, with the philosophical and human element 'almost invisible under a mass of technical details'. Be that as it may, Weyl is here contrasting the unattractive, mechanical amassing of details, the 'blind' following of serial processes, with the more pleasing insight into the whole, the context and the overall path to be traversed. Similarly,

the system of real numbers is like a Janus head with two oppositely directed faces. In one respect it is the domain of the operations + and \times and their inverses [left hemisphere]; in another it is a continuous manifold [right hemisphere], and the two are

continuously related [right hemisphere's synthetic take on both]. One is the algebraic and the other is the topological face of numbers ... neither one of the two ways of understanding, the topological or the algebraic, can be acknowledged to have unconditional advantage over the other ... In topology we begin with the notion of continuous connection ... Algebra views [its] operations as the beginning of all mathematical thinking, and *admits continuity*, or some algebraic *surrogate* of continuity, *at the last step* of specialization. The two methods follow opposite directions. Little wonder that they don't get on well together. What is most easily accessible to one is often most deeply hidden to the other. Such classical theories as that of algebraic functions can be made to fit both viewpoints. But viewed from these two viewpoints they present completely different sights. ¹¹⁶

Note that in conveying these two ways of understanding mathematics, Weyl contrasts one that is 'continuous' or 'topological', suggestive of the right hemisphere, with one that is made up of serial 'operations' (procedures) carried out on 'algebraic' signs (abstract discrete entities), suggestive of the left hemisphere. Both are, however, related 'continuously', that is by the process of the right hemisphere, though neither has unconditional advantage. Algebra 'views' its operations as grounding the process, but has to admit the continuous at some point, which it postpones until 'the last step'. They see different things and 'don't get on well together'. However:

whenever applicable, the topological method appears, thus far, to be more effective than the algebraic one. Abstract algebra has not yet produced successes comparable to the successes of the topological method ... I do not want to conceal from you the growing feeling among mathematicians that the fruitfulness of the abstracting method is close to exhaustion. It is a fact that beautiful general concepts do not drop out of the sky. The truth is that, to begin with, there are definite concrete problems, with all their undivided complexity, and these must be conquered by individuals relying on brute force. Only then come the axiomatizers and conclude that instead of straining to break in the door and bloodying one's hands

one should have first constructed a magic key of such and such shape and then the door would have opened quietly, as if by itself. But they can construct the key only because the successful breakthrough enables them to study the lock *front and back*, from the outside and from the inside.¹¹⁷

Once the intuition gets you in the door, you can figure out how to unlock it. Once a leap of intuition gets you to your conclusion, you can reconstruct a path that you might have taken – but did not in fact take – to get there. This has something to say to the nature of reason, namely that it needs to transcend its intrinsic limitations in order to be able to operate rationally.

Jacques Hadamard similarly commented that ‘any mathematical argument, however complicated, must appear to me as a unique thing. I do not feel that I have understood it as long as I do not succeed in grasping it in one global idea’.¹¹⁸ And he also emphasised the suddenness of insight, which he repeatedly likened to a strike of lightning.¹¹⁹ Yet at the same time, he draws attention to the fact that insight does not, as Weyl puts it, ‘drop out of the sky’: there is a period of preparation, during which an exertion is made, a period which is often long and exhausting. It is in the state of fatigue after this exertion, when the mind relaxes, that the illumination comes. In fact he comments that it is ‘as though it were necessary for the conscious self to be weakened in order that unconscious ideas may break through.’¹²⁰ In our own day this view of mathematical thought as requiring the transcendence of computational methods that could be made explicit is in keeping with the view of Roger Penrose, as set forth in his *Shadows of the Mind*: mathematical invention cannot be modelled as computation.¹²¹

Unsurprisingly, there is a parallel distinction to be made among philosophers as there is among mathematicians. As Jan Zwicky suggests:

Philosophers fall into roughly two classes: those who trust their perceptions more than they trust language, and those who trust language more than they trust their perceptions. Berkeley and Herakleitos fall into the first class, Locke and Parmenides into the second. And, although we don’t take sufficient notice of this, to each class there *also* corresponds a distinct notion of abstract thought:

members of the first class tend to think of it as a grasp of structural features [seeing the patterns] ... while members of the second tend to think of it as the logico-linguistic manipulation of non-structurally-conceived placeholders [algebra].¹²²

There is, as discussed previously, a peculiar bias towards language and naming in Western culture.¹²³

In the 1960s, the architect and philosopher Christopher Alexander asked women students at a top American college, Radcliffe, to arrange short strips of paper consisting of random segments of black and white, in any way they chose. What interested him was that there were effectively two strategies for doing so. One might be described as sequential-digital, the other as figural-holistic. He saw that the first was ‘less interesting, and ... functionally less likely to be important in the behavior of real systems’. The second was ‘deeper and more interesting’, since it was more pertinent to the study of real physical systems such as emerging galaxies or developing embryos. He wanted to see what these young women, highly intelligent, but highly educated, made of it all. He found that 80% chose the sequential-digital approach, only 20% the figurative-holistic.¹²⁴ This is a tendency that is more marked in Westerners than non-Westerners, and in part reflects the *Einstellung* effect discussed in Chapter 4. (He assumed that the results would be the same for women as for men; as I showed in the same chapter, men tend to think more holistically, women more sequentially, so this result has to be interpreted in that light.)

We have seen that scientists and mathematicians, just like artists, make discoveries by having moments of insight into analogous forms, guided by intuition, hardly ever, if at all, by following a sequential process. On this the historical record is very clear. Insights may come on the back of much routine slog, but the moment of insight itself never comes this way. To take just two famous examples: Einstein thought in musical shapes; Bohr’s notebooks contain no words or formulae, just pictures. So why is it that our education is largely geared to learning how to carry out rote procedures in a sequential, linear fashion?

We can kill creativity by instituting regular ‘procedures’ and closely monitoring the process – all of which the left hemisphere does best. This succeeds in over-controlling the ‘product’, and ensuring mediocrity (though without, of course, avoiding mistakes). It rules out anything not explicit,

and already foreseen in the schema. And it discourages analogical thinking: seeing the patterns that come to us through intuition. It's not new procedures we need: it's new shapes, new *Gestalten* – new wholes.

THE IMPERSONAL VS THE PERSONAL

We are inclined to be too easily persuaded by the rhetoric of academic philosophy into thinking that there is something impersonal, pure and eternal about the sort of reasoning in which it engages. Much as the beaker *was placed* in the fume cupboard, apparently without the intervention of anything so fallible as a human hand, we imagine that such reasoning carries no taint of flesh about it. We overlook the nature of the philosopher, and thus of the very particular nature of philosophical discourse, to which it is indissolubly linked. It is easy to forget that philosophical discourse is only one way of understanding the world, and inevitably a personal one. Personal elements come in different forms, but are inescapable, since what Thomas Nagel calls the ‘view from nowhere’ is impossible, and the very attempt does little more than speak of the personality making it. We cannot abstract philosophy from the happenstance of the physical being that dreamed it up.

To engage in philosophy is, I believe, as much a response to an instinct as to engage in science. Philosophers might be unlikely to agree. Or would they?

The idealist philosopher FH Bradley wrote that ‘metaphysics is the finding of bad reasons for what we believe upon instinct, but to find these reasons is no less an instinct.’¹²⁵ That reasons often come late in the process, and are retro-fitted, is a point emphasised by the philosopher Francis Cornford:

Almost all philosophical arguments are invented ... to recommend, or defend from attack, conclusions which the philosopher was from the outset bent upon believing ... To mistake [philosophical reasonings] for the causes which lead to a belief in the conclusion, is generally to fall into a naïve error.¹²⁶

Economist John Kay has some incisive thoughts on this matter, in relation to what Benjamin Franklin called ‘moral or prudential algebra’, a process in which one sets out pros and cons, attaches numerical weights to

each consideration, and arrives at a balanced, and therefore, impartial moral judgment. Here is Kay's account:

Franklin knew very well that this is not how real people, including himself, behaved. Franklin was an occasional vegetarian, having balanced the moral, nutritional and practical arguments. But confronted with the delicious smell of freshly grilled fish, he observed that the fish themselves disregarded his precepts by eating other fish and so deserved to be eaten. 'How convenient it is', he said, 'to be a reasonable creature, since it enables one to make or find a reason for whatever one has a mind to do.'¹²⁷

Franklin, who had a well-developed sense of humour, was surely speaking tongue in cheek, but the point is nicely made – and very real.

Temperament counts for much in what we find in the world. Fichte wrote that the

sort of philosophy one chooses depends ... on what sort of man one is; for a philosophical system is not a dead piece of furniture that we accept or reject as we wish; it is rather a thing animated by the soul of the person who holds it.¹²⁸

There is a difference between the view of philosophy as an edifice and as a dwelling. (Incidentally, the original meaning of the Greek word *ethos*, from which the word 'ethics' derives, is 'dwelling place').¹²⁹ In the one view it is something *constructed*, piecemeal, as it were from the outside; in the other it is something coming about through being lived, as it were from the inside. 'Place yourself', writes William James,

at the centre of a man's philosophic vision and you understand at once all the different things it makes him write or say. But keep outside, use your post-mortem method, try to build the philosophy up out of the single phrases, taking first one and then another and seeking to make them fit, and of course you fail. You crawl over the thing like a myopic ant over a building, tumbling into every

microscopic crack or fissure, finding nothing but inconsistencies, and never suspecting that a centre exists.’¹³⁰

Note ‘post-mortem’. Philosophy is not, then, purely a matter of impersonal reason, but living: bound up in the temperament, character and history of the person who expounds it. As Dewey pointed out, ‘every particular case of thinking is what it is because of some attitude, some bias’ and, as for the philosopher, ‘when he becomes a thinker he does not leave his characteristic affection [inclination] behind.’¹³¹ Moreover Wittgenstein, too, thought that ultimately differences of temperament lay behind many philosophical disputes;¹³² and William James wrote frankly that ‘the history of philosophy is to a great extent that of a certain clash of human temperaments.’¹³³

So, when we set out to investigate the world objectively, are we at the end of the day only reporting on ourselves? ‘However far man may extend himself with his knowledge, however objective he may appear to himself’, wrote Nietzsche, ‘ultimately he reaps nothing but his own biography.’¹³⁴ Elsewhere he expanded the idea:

It has gradually become clear to me what every great philosophy has hitherto been: a confession on the part of its author and a kind of involuntary and unconscious memoir ... I accordingly do not believe a ‘drive to knowledge’ to be the father of philosophy, but that another drive has, here as elsewhere, only employed knowledge (and false knowledge!) as a tool. ¹³⁵

This is intriguing, because of my belief that the *raison d’être* of the left hemisphere, which is to manipulate the world, underlies the coercive drive implicit in logical argument: as Nietzsche puts it, another ‘drive’, a will to power, acts under cover of an apparently impeccable, because *impersonal*, aim in order to achieve its own ends. It is not just that philosophy can never free itself from personality: a person’s philosophy may be doing *psychological work for that personality*, which might explain why philosophies are so passionately defended. Nietzsche continues:

even apart from the value of such claims as ‘there is a categorical imperative in us’, one can still always ask: what does such a claim tell us about the man who makes it?

Rather more trenchantly, Iris Murdoch wrote: ‘It is always a significant question to ask about any philosopher: what is he afraid of?’¹³⁶ In many cases it would seem to be uncertainty, vulnerability, laying oneself open to truth from experience – and to hell with the theory.

Though I confess to a lifelong addiction to it, there is a sense in which philosophy is in itself an unhealthy activity: the disease, perhaps, as Karl Kraus said of psychoanalysis, for which it purports to be the cure. Jung wrote:

For all its critical analysis philosophy has not yet managed to root out its psychopaths ... Philosophy still has to learn that it is made by human beings and depends to an alarming degree on their psychic constitution. In the critical philosophy of the future there will be a chapter on ‘The Psychopathology of Philosophy’ ... Often what is thought is less important than who thinks it. But this is assiduously overlooked. Neurosis addles the brain of every philosopher because he is at odds with himself. His philosophy is then nothing but a systematised struggle with his own uncertainty.¹³⁷

Indeed – well, sometimes. And the point here is, not just that philosophy is reflective of any old psychopathology that just happens on an individual basis to be present, but that a certain kind of unusual mind is preferentially and systematically attracted to philosophy of the analytic kind. This is a mind somewhere down the schizo-autistic spectrum, as many examples of now famous philosophers in the analytic tradition attest. For a philosopher such as Collingwood, imagination and empathy, the appreciation of context, both personal and historical, as well as the ability to feel your way into another’s mind (all skills that are highly right hemisphere-dependent), play a crucial role in understanding, ‘unlike philosophers in the Ryle mould’.¹³⁸

‘Philosophers in the Ryle mould’ are more likely to take things out of context, think in disembodied schemata, and adopt irrationally rationalistic approaches. They tend towards utilitarianism in ethics, an approach that is

also characteristic of people with frontal lobe damage, especially in the right hemisphere, the clinical picture of which resembles some types of autism.¹³⁹ Which is not, of course, to say that all utilitarian philosophers are autistic – or that psychopathology makes the perceptions of its sufferers invalid: it may actually make some things easier to see, while hiding or distorting others. But it does invite the question why we should attach particular importance to a way of looking at the world which is typical of a spectrum of conditions which normally lead to their holders receiving treatment for a distressing illness.

According to Louis Sass's observations of schizophrenia, madness may be 'the endpoint of the trajectory consciousness follows when it separates from the body and the passions, and from the social and practical world, and turns in upon itself' – the more the world is purely cognitive, the closer madness and philosophy come together.¹⁴⁰ And as Sass has demonstrated, one can see from both Wittgenstein's notebooks and from Schreber's self-account that in both a position of alienation makes for a sense of unreality.¹⁴¹ Hannah Arendt suggested that philosophy, as she knew it, was something unnatural and 'out-of-order', something *contrary* to the health of the human condition.¹⁴²

Detachment is certainly necessary in some contexts, but it does not always and alone lead to better insights than engagement. Indeed, it may be safer to recognise the degree to which our minds, bodies, emotions and the environment are indissolubly linked than to pretend that they are not. And not just because these elements are some form of 'bias': the failure to take them into account may also lead to bias – distorted perceptions and a limited understanding of what one is dealing with. The closest humans get to being cut off from feelings, the body and the self is achieved not by great scientists, but by subjects with schizophrenia.¹⁴³

Nietzsche amusingly comments, alluding to his idea of philosophy as an involuntary autobiography, that, in the case of Kant, it was not even 'an involuntary biography of a soul but ... the biography of a *head*.'¹⁴⁴ Roger Scruton points out that the great modern philosophers have tended to 'avoid the experience of desire as scrupulously as they have tended to avoid its analysis'.¹⁴⁵ He quotes Kant's description of marriage as an agreement between two people as to the 'reciprocal use of each other's sexual organs'. He might also have quoted Spinoza on love: 'titillation accompanied by the

idea of an external cause'.¹⁴⁶ But Freud's attitude to sexual desire is almost as expressive of a sort of fastidious alienation, its aim, according to him, being the 'union of the genitals in the act known as copulation, which leads to a release of the sexual tension and a temporary extinction of the sexual instinct – a satisfaction analogous to the sating of hunger.'¹⁴⁷ He described the task of psychoanalysis as drying up the messy emotions of the patient. 'Where Id was, there shall Ego be', he declared somewhat portentously. 'It is reclamation work, like the draining of the Zuyder Zee'.¹⁴⁸ Perhaps Freud's biographer Ernest Jones could be referring to his own mentor, among others, when he suggested that philosophers are people who have been 'impelled to deal with various personal problems in their unconscious by making serious efforts to think consciously; they have intellectualized the emotional conflicts.'¹⁴⁹ The recommendation in Freud's technical papers for analysts to be emotionless, according to Ferenczi and Rank, had led to 'an unnatural elimination of all human factors' and to 'a theorizing of experience'.¹⁵⁰

Approaching the relationship between philosophy and autism from the other direction, it is not just that there may be something autistic about certain philosophical styles, but there is a certain philosophical style to the pronouncements of subjects with autism. Tony Attwood, an acknowledged expert on the autistic spectrum, writes that there is a 'quasi-philosophical quality' to the autobiographies of adults with Asperger's syndrome.¹⁵¹ What he is referring to is generally accepted to be an over-rationalistic, hyper-reflexive self-awareness, and a disengagement from emotion and embodied existence, which is very much in accord with my experience of looking after subjects on the autistic spectrum. Moreover, there is an abstract, quasi-philosophical mode of talking that is common in some kinds of schizophrenia, at first impressive, but ultimately recalcitrant to understanding; it is sometimes actually referred to as 'pseudo-philosophical thought disorder'.¹⁵² Both autistic and schizophrenic individuals have an antipathy to what is embodied, uncertain and unknown (or unknowable), preferring what is abstract, certain and known, all of which is characteristic of the left hemisphere.

There is something like a sickness of the soul in requiring proof (in the left hemisphere sense) of absolute certainty. Thus Merleau-Ponty wrote:

If I like, I can always be strict and put in doubt the reality of the other's feelings towards me; this is because such feelings are never *absolutely* proved ... the normal, non-pathological attitude consists in having confidence above and beyond what can be proved ... by means of the generosity of the *praxis*, by means of an action that proves itself in being carried out.¹⁵³

The word 'generosity' there is not idle. There can be at times a hint of something mean and suspicious about calculation and the need for proof – a failure of trust. Life is an intrinsically exuberant, superabundant business, and to respond to it in a calculating spirit is an offence against nature. 'O reason not the need', cried Lear, when his daughters tried to calculate what he could get by without: could Lear's outrage still be understood in this era of accountancy?

Here I might make an aside on the philosophical personality. If I am right, as I argued in Chapter 9, that schizo-autistic features suggest a tendency to left hemisphere modes of apprehension of the world, and depressive features suggest the opposite, one would expect highly analytic philosophers to have character features suggesting they are on the schizo-autistic spectrum. Descartes had many hallmarks of the schizoid personality;¹⁵⁴ Spinoza and Kant were probably on the autistic spectrum, and so, clearly, was Bentham; in modern times there is a case that Bertrand Russell, AJ Ayer, and Derek Parfit also were, to name a few.¹⁵⁵ Similarly, one might expect philosophers who were opposed to the analytic tradition to be more prone to depression; it is arguable that Pascal, Hegel, Kierkegaard, Emerson, CS Peirce, William James and John Dewey were.¹⁵⁶ Wittgenstein is an intriguing case here, because the early Wittgenstein of the *Tractatus* was highly analytical, though his very purpose was to show the limits of linear analytical reasoning: he thought that logic and propositionalising left all matters of value untouched. Appropriately, then, it is well known that he had many features of a schizoid personality¹⁵⁷ and of Asperger's syndrome;¹⁵⁸ but, particularly latterly, he also suffered from bouts of depression.¹⁵⁹

Let me be quite clear: people are massively complicated, and except perhaps in extreme cases, you can't put people in boxes marked 'left' and 'right'. Since the right hemisphere is always aware of the need for the left,

and the left not aware of the need for the right, it is always going to be more clear-cut, more obviously unbalanced, when the tendency is to adopt left hemisphere modes of thinking. That is why I have structured my comments on philosophers as a *relatively* clear relation between the left hemisphere and those of the analytic tradition – versus the rest. The ‘opponents’ I have mentioned were also perfectly capable of analysis. They would have subscribed to Pascal’s ‘two excesses: to admit only reason or to rule it out’. It’s just that analytic types usually see only one of these two excesses.

Since, clearly, retrospective diagnoses are prone to error, autistic spectrum conditions not infrequently overlap with depression, and there must undoubtedly be counter-examples, why bring it up at all? Because there might just be *something* in it. For example, in an unpublished study, which I carried out as a Medical Registrar in the 1980s, of the degree subjects undertaken by approximately 200 university students who then went on to be admitted to the Bethlem Royal & Maudsley Hospital in London during a psychotic episode, I found that a subsequent diagnosis of schizophrenia was most strongly associated with having chosen to study engineering, followed closely by philosophy ($p > 0.001$). The abstract, impersonal, sequentialist approach of philosophy distinguishes it from all other humanities subjects (eg, literature, history), which require more understanding of humanity in the round, and which were the commonest degree choices amongst those who were subsequently diagnosed with an affective psychosis (psychotic depression or bipolar disorder).

My purpose here is neither to romanticise psychopathology nor to give a reductive account of philosophy, but to illustrate the inevitable connexions between individual psychology and philosophy, so often commented on by philosophers themselves. We cannot divorce the philosophy from the philosopher. I am sure that saying this will be resisted by many, and resented by some – but, though you can ignore it, it is hard to deny its truth. The options are to remain in denial (left hemisphere-preferred strategy) or to use the knowledge to avoid pitfalls (right hemisphere-preferred strategy).

Most appositely of all, the philosopher Paul Feyerabend wrote:

Schizophrenics very often hold beliefs which are as rigid, all-pervasive, and unconnected with reality, as are the best dogmatic philosophies. However, such beliefs come to them naturally, whereas a ‘critical’ philosopher may sometimes spend his whole life

in attempting to find arguments which create a similar state of mind.¹⁶⁰

It is a fascinating reflection. Two of the greatest phenomenologists of schizophrenia, Eugène Minkowski and Wolfgang Blankenburg, suggested that schizophrenics attempt to compensate for a loss of intuition, of that vital, pre-reflective grasp of reality, by a sort of pseudo-philosophising, or ‘hyper-reflection’ on experience – essentially a disease of over-awareness, in which things that should run smoothly at the preconscious level are yanked into the focus of awareness, where life comes to a juddering halt.¹⁶¹

Schizophrenics are in fact *more*, not less, logical than normal subjects, and deficient in common sense.¹⁶² The theme has been explored by a number of contemporary psychologists and psychiatrists, such as Louis Sass and Giovanni Stanghellini.¹⁶³ It could explain a lot about contemporary academic philosophy, such as brains in vats, and various types of Cartesian scepticism, not to mention the denial of consistent human persons, or – most bizarre of all – the denial by intelligent human beings of conscious experience itself.

Since philosophy is related to individual psychology, the influence might run either way. Am I right to assume that, in my study of 200 psychotic subjects who broke down while studying at university, psychopathology influenced the choice of philosophy as a subject of study, rather than that philosophy as a subject of study actually precipitated episodes of psychosis? Probably, as usual, the answer is that both might operate to some degree: the process is not linear but circular. I had a patient, a philosopher, who suffered from obsessive-compulsive disorder: he reported that he was quite well as long as he was studying phenomenological philosophers, with their acceptance of uncertainty, but not when he was studying analytical philosophers, with their intolerance of it. Then it was that he developed OCD (obsessive-compulsive disorder) symptoms.

There may be something damaging to the whole character of a person in spending a life in abstract reasoning, whether in philosophy or science. I think of a famous, and touching, passage in Darwin’s *Autobiography*:

I have said that in one respect my mind has changed during the last twenty or thirty years. Up to the age of thirty, or beyond it, poetry of many kinds, such as the works of Milton, Gray, Byron, Wordsworth, Coleridge, and Shelley, gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great delight. But now for many years I cannot endure to read a line of poetry: I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also almost lost my taste for pictures or music ... My mind seems to have become a kind of machine for grinding general laws out of large collections of facts ... and if I had to live my life again, I would have made a rule to read some poetry and listen to some music at least once every week; for perhaps the parts of my brain now atrophied would thus have been kept active through use. The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature.¹⁶⁴

As they say, be careful what you wish for. Some 20 years earlier, in a letter to Huxley, Darwin had written: ‘alas’ – and how I respect that ‘alas’ – ‘a scientific man ought to have no wishes, no affections, – a mere heart of stone.’¹⁶⁵

Before we move on, let me not duck the question of how much my own thinking is shaped by the sort of person I am.

Inevitably my personality is, as I have argued, bound to underwrite my thinking. Although I count myself very fortunate and get a lot of fun out of life, I have had several episodes of depression over my lifetime, mercifully well contained, but devastating while they lasted. And I have always had a passion for nature and for art. I suspect my overall temperament makes me sympathetic to the right hemisphere’s outlook, in as much as these things have any validity.

I think it is also true that my personality has guided my preoccupations. As a young man I was lamentably perfectionistic: it may lie behind my desire to decry the barrenness of perfection. (The book I wrote in my 20s called *Against Criticism* was at one stage going to be called *The Importance of Imperfection*. When the proofs came, I rang my editor with a fifth round

of corrections, which included a comma in the wrong font. She accepted the correction, but suggested that it might be a good idea if I now took a holiday.) But, at least, it made me want to argue *against* the value of perfection, not to propagate it. Many of the things I argue for I have – like many philosophers, as we have seen – felt obscurely all my life to be important. Whether that counts against them or for them I cannot say. On that point, it might be worth recounting a story of Niels Bohr:

Bohr never referred to his philosophy as his own. He used to speak of it as a general lesson to be drawn from quantum mechanics. Yet when, shortly after the development of quantum mechanics, he told his old friend Edgar Rubin, the psychologist, of this general lesson, Rubin replied, ‘Yes, it’s very interesting, but you must admit that you said just the same thing twenty years ago’ ... Bohr has said that as far back as he could remember he liked to dream of great interrelationships. His philosophical attitude seems to have been shaped early with very little influence from outside, and he spent much time developing it. Shortly before his death Bohr spoke of his youthful philosophical work. When asked what place this work then had in his existence, he replied, ‘It was, in a way, my life!’¹⁶⁶

Someone once asked me, acutely, after I quoted the line of Iris Murdoch, ‘so what are *you* afraid of?’ I don’t remember my answer. At this stage, with death not far off, I don’t fear anything much that I am aware of, not even death, as long as it doesn’t come too soon for me to finish this book. In the past I was afraid of stepping out of line too much and making a fool of myself. Now that I know how foolish we all are, I am happy to be just another human being.

With respect to the major themes of this chapter, in writing this book I have found it necessary to move back and forth between the distance that makes possible the detection of patterns, on the one hand, and the immediacy of experimental data and experience with patients, on the other, out of which the patterns emerge. To the extent that I have succeeded, it represents an example of fruitful hemispheric co-operation: aiming not to construct a linear structure of hard-edged categories, but to bring into focus a new *Gestalt*. In doing this I have aimed to combine precision about findings, with tolerance of necessarily imprecise structures in the process of

bringing the whole into focus, so as to be faithful to the findings; since precision at too early a stage of resolving the *Gestalt*, throws the whole structure out. In changing a wheel on a car, one does not fully tighten any one bolt until all are roughly in alignment. Science is not like building a wall, where the first steps must be fixed in advance of the rest: it is about bringing our ideas and the world into alignment, a reverberative, not a linear process. Whitehead puts it well:

The true method of discovery is like the flight of an aeroplane. It starts from the ground of particular observation; it makes a flight in the thin air of imaginative generalization; and it again lands for renewed observation rendered acute by rational interpretation. ¹⁶⁷

And so for many iterations. In doing this I have wrestled hard to press abstraction, precision and linearity and all the other rational progeny of the left hemisphere in the service of their opposites. That is suitably paradoxical at one level; quite logical at another.

LOGOS VS MYTHOS

Where do all these twins leave us when considering the nature of Reason's assistance in our attempts to approach truth? I would suggest that our culture has tended to fall for the persuasive power of those twins that claim paternity by the left hemisphere, leading us to expect truth, or at least our attempts to express it, to be clear, precise, impersonal, probably abstract and unreasonably certain. In sum, we expect our truths to be something which we casually designate 'literally true'; anything that isn't 'literally true', we tell ourselves, isn't true at all. The opposite members of each pair of twins not only warn that these are false claims, but point, however tentatively, to the truths which such a view has concealed from our sight. But most of all the cautionary twins warn us about literalism, reminding us that all expressions of truth are rooted in metaphor and that literal truth is a chimera.

The subject of literalism is close to my heart – as it was to my father's, though in a different sense. My father was a decent, devoted, down-to-earth family doctor, who had no interest in novels, little in poetry, and none in classical music, especially none – perish the thought – in ballet or opera. It was the school holidays, and I was watching a televised relay of Mozart's *Don Giovanni* from Glyndebourne, when my father came into the room. The opera had barely begun, and it was that dramatic moment when the Don has just fatally wounded the dignified Commendatore, the veteran soldier and father of the Don's catch of the moment, Donna Anna, by a blow to the heart in a duel over his daughter's honour. The Commendatore lies dying, the violins are delivering throbbing arpeggios, and the old man, lying propped on one arm, sings in an urgent cadence: '*Ah, soccorso!*' – 'Help me!' There ensues the following conversation:

My father: 'What's this?'

Me: (tentatively) 'It's – Mozart ... an opera called *Don Giovanni*.'

My father: 'Well, that's ridiculous.'

Me: 'What's ridiculous?'

My father: (dismissively) 'Well he's just sustained a pneumothorax.'

No-one can sing when they've sustained a *pneumothorax*.'

This judgment delivered, my father left the room to return to his latest book on archaeology, a sort of passion of his, since there were an abundance of facts, and mercifully few artefacts, to be dug up.

Although I suspect my readers will want to distance themselves from this standpoint, I suspect also that some covertly share a modified version of it. For it has to do with the nature of truth. Science is what delivers truth, they will say – as indeed my father did. The arts deliver pretty, diverting, consoling – at times, they might concede, beautiful, engaging, and even disturbing – myths. Of which Mozart's *Don Giovanni* is one. But myths are, of course, false, aren't they? Nice enough to pass the time of day with, but nothing to do with truth.

Perhaps the best rant along these lines comes from William Cobbett, the late eighteenth- and early nineteenth-century farmer and political reformer, who wrote of *Paradise Lost*:

... the whole of Milton's poem, is such barbarous trash, so outrageously offensive to reason and to common sense, that one is naturally led to wonder, how it can have been tolerated by a people amongst whom astronomy, navigation, and chemistry are understood.¹⁶⁸

People who don't understand that myths are not to be taken literally, but nonetheless exist to express truths that everyday language is too limited, too narrow, too precise to convey, are like people who would dismiss Shakespeare's *King Lear* on the grounds that, according to the chronicles of Geoffrey of Monmouth, the historical Leir (as he was known prior to Shakespeare), fled to France, and with the help of Cordelia and her husband, overthrew his other daughters and sons-in-law, and was restored to the throne. Thus tactlessly ruining the tragedy. Or object that since Geoffrey's history, too, was of uncertain provenance, we know nothing reliable of the historical King Lear at all – if indeed he ever actually existed. Ergo, Shakespeare got it wrong.

The word 'myth', which derives from an ancient Greek word *mythos* (or *muthos*), was unknown in English, according to the *OED*, till just before the middle of the nineteenth century, when it was adopted by philologists and classical scholars to denote ancient stories – as opposed to ancient history. 'Story', by the way, is just an aphetic version of 'history', that is to say a

word form in which part has, over time, been lost. But as story and history separated, the status of a story became more ambiguous: there developed a slightly unfavourable assumption that it might not be true, whereas there is a presumption that history refers to something on which one can, more or less, rely. In modern English we even say ‘to tell stories’, meaning to *lie*. A similar fate has overtaken ‘fable’ (like ‘fate’ itself, from Latin *fari*, to speak: originally, ‘something that was spoken’, a narrative). Nowadays if narratives are considered fables, it is in the sense of untruths. And a legend was something proper ‘to be read’ (from the gerundive, *legendus*, of Latin *legere*, to read). According to the *OED*, it was only in the seventeenth century that ‘legend’ took on the meaning of something untrue.

There is a similar history to ‘metaphor’ (from Greek, *meta-*, across, + *pherein*, to carry), that which carries you over from an idea to an embodied experience. It is the root of all meaning: I cannot escape using the word ‘root’ here as a metaphor.¹⁶⁹ Yet by the seventeenth century, in the dawn of the new age of Enlightenment, Locke could write:

... all the artificial and figurative application of words eloquence hath invented, are for nothing else but to insinuate wrong ideas, move the passions, and thereby mislead the judgment; and so indeed are perfect cheats ...¹⁷⁰

And so it has been with ‘myth’. Alasdair MacIntyre points out the novelty, again arising at the Enlightenment, of the idea of ‘facts’ as reflecting a reality independent of our judgment:

Facts, like telescopes and wigs for gentlemen, were a seventeenth-century invention. In the sixteenth century and earlier ‘fact’ in English was usually a rendering of the Latin ‘factum’, a deed, an action, and sometimes in Scholastic Latin an event or an occasion ... It is of course and always was harmless, philosophically and otherwise, to use the word ‘fact’ of what a judgment states. What is and was not harmless, but highly misleading, was to conceive a realm of facts *independent of judgment or of any other form of linguistic expression*.¹⁷¹

It's not as if, until this use of 'fact' came along, no-one knew the difference between things that happened and things that hadn't. According to NT Wright, it is only with the new emphasis on certainty with the Enlightenment, 'with the suspiciously bright light of an incipient scientism', that facts suddenly come into prominence:

Everything else is suspect; give us facts. Science says, 'Well, we'll try'; scientism says, 'Here you are – and you must take our philosophy as well.'¹⁷²

A fact is presumed to be true independent of context. But no human knowledge is ever independent of context, even if only that it is human, and derived from experience. No world view can transcend such limitations – limitations that are by no means fatal to serviceable truths, but are fatal to the hubristic enterprise of accounting for the world fully in some impersonal way by what we call facts.

As Douglas Hofstadter points out, logic is neat and clean, but, if it is to lead to understanding, those very qualities get in the way:

Why should not logicians, more than anyone, realize the places where hard-edged, clean logic will necessarily run into trouble in dealing with this chaotic and messy universe? One of Marvin Minsky's favourite claims is 'Logic doesn't apply to the real world.' There is a sense in which this is true. This is one of the difficulties that artificial intelligence workers are facing. They are coming to realise that no intelligence can be based on reasoning alone; or rather that isolated reasoning is impossible, because reasoning depends on a prior setting-up of a system of concepts, percepts, classes, categories – call them what you will – in terms of which all situations are understood. It is there that biases and selection enter the picture. ¹⁷³

Or as Einstein put it succinctly: 'As far as the propositions of mathematics refer to reality, they are not certain; as far as they are certain, they do not refer to reality.'¹⁷⁴

One path to knowledge is logic, which we now think of as something literal and explicit. The Greeks, though, who, after all, invented what one might call the Western logical tradition, hardly invented logic. ‘Logic’, as Bruno Snell pointed out,

has been in existence ever since men have talked and thought; the reason why it did not, at first, find expression in speech was not that logic did not exist but that it was *implicit and understood*. As soon, however, as it is discovered, and intrudes into consciousness, human thinking undergoes a radical change ...¹⁷⁵

In other words, the Greeks did not invent logic; it’s just that what before had been the ground of our thinking was suddenly foregrounded. A spotlight was thrown on it, and this, as Snell says, changed everything. This difference between something remaining as the ground, and coming to be foregrounded, is an important theme of this book, since it refers to the different mode of operation of the two hemispheres. The left hemisphere’s attention latches onto the salient feature, what lies in the focus of attention, and effectively isolates it. The right hemisphere’s attention is to the whole scene, especially to the context or background in which the salient feature finds itself placed.

Whitehead sets this in the context of normal psychology:

It is a profoundly erroneous truism, repeated by all copy-books and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them. Operations of thought are like cavalry charges in a battle – they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.¹⁷⁶

It could be said that the trouble with Western philosophy began with Plato’s foregrounding of *logos*. In the Greek world, as in most pre-modern cultures, there had always existed more than one way of acquiring an understanding of the world. The Greeks, let it not be forgotten, also gave

birth to many of the most enduring myths by which we understand our relationship to the world, such as those of Œdipus, of Prometheus, of the gods of the *Iliad* and of the *Odyssey*. There was, and is, no conflict here. Indeed they distinguished two types of truth, *mythos* and *logos*; each was considered essential in its own proper field, and the two were not to be confused. So Karen Armstrong writes:

Logos ('reason') was the pragmatic mode of thought that enabled people to function effectively in the world. It had, therefore, to correspond accurately to external reality. People have always needed *logos* to make an efficient weapon, organize their societies, or plan an expedition. *Logos* was forward-looking, continually on the lookout for new ways of controlling the environment ... *Logos* was essential to the survival of our species.

But *logos* had its limitations. Good at manipulating the world and making us powerful, it did not contribute to any broader understanding of the meaning of our lives – for that people turned to *mythos*. Armstrong continues:

Myths may have told stories about the gods, but they were really focused on the more elusive, puzzling, and tragic aspects of the human predicament that lay outside the remit of *logos* ... When a myth described heroes threading their way through labyrinths, descending into the underworld, or fighting monsters, these were not understood as primarily factual stories. They were designed to help people negotiate the obscure regions of the psyche, which are difficult to access but which profoundly influence our thought and behaviour ... When Freud and Jung began to chart their scientific search for the soul, they instinctively turned to these ancient myths. A myth was never intended as an accurate account of a historical event; it was *something that had in some sense happened once but that also happens all the time*.¹⁷⁷

In other words, myths were archetypal, not incidental, truths, reflecting eternal patterns that we could recognise, but which could not, without

diminishment, be translated into the everyday terms of *logos*. And, as Armstrong goes on to emphasise, myths were not primarily propositional, but grounded in action. The truth of a myth was not verified by data, but in the playing out of one's life:

The only way to assess the value and truth of any myth was to act upon it. The myth of the hero, for example, which takes the same form in nearly all cultural traditions ... showed us how to live more richly and intensely, how to cope with our mortality, and how creatively to endure the suffering that flesh is heir to. But if we failed to apply it to our situation, a myth would remain abstract and incredible.

However, things were slightly more complex than this suggests, since *logos* and *mythos* went through a number of transformations.¹⁷⁸ At one stage, indeed, according to the historian of ideas Bruce Lincoln, it was *logos* that was thought of as unreliable, feminine and seductive:

the most ancient texts consistently use the term *logos* to mark a speech of women, the weak, the young, and the shrewd, a speech that tends to be soft, delightful, charming, and alluring, but one that can also deceive and mislead.¹⁷⁹

'Words, words, words ...' This would certainly fit with Mercier and Sperber's view that logic was invented in order to win arguments, not to take us closer to the truth.

Mythoi by contrast were the ideals of men of action, weighty, performative, supportive of the truth: *alēthea mythēsasthai* ('to speak the truth') occurs as a formula five times in Homer, Hesiod and the *Homeric Hymns* (all prior to the end of the seventh century BC). *Mythoi* can at times be corrupt, but when they are, the effect is shocking and implies shame, such as if a lawyer were to lie; whereas the corruption of *logos*, at this stage, was taken for granted: 'the lying *logos* is deceptive, disingenuous and slyly delivered, hard to detect, the more to be guarded against'.¹⁸⁰

It's worth noting that *mythos* is inclusive of *logos*, whereas *logos* is exclusive of *mythos*. *Mythos* 'denotes the whole package, the *logos* plus the

speaker and the context; when *mythos* is in play, something is at stake'.¹⁸¹ It is thus dependent to an extent on trust in the authority of the speaker: as soon as people routinely question the authority of heroic figures, it loses power. Thus it is that with Plato one sees a reversal of the fortunes of *mythoi*. He cites them generally unfavourably in respect of their truth in numerous places, though he concedes there is 'some truth' in them.¹⁸² In reality, he is himself the inventor of several of the best-known myths of ancient philosophy: the myths of Atlantis, of Er's journey into the afterlife, of the ring of Gyges, of the chariot of Phæthon, not to mention the myth of the Cave.¹⁸³ Plato was complex. However, his legacy has been one-sided; and from this point onwards, truth is no longer thought of as that which comes from the experience of living, but as what can be argued towards without reference to context. Such a view is a necessary counterpoise, and can be productive: but as always, there needs to be a balance.

It will be obvious to the reader that *mythos*, in its trans-linguistic, implicit, richly connotative, performative way, rooted as much in the body and emotion as it is in cognition, is more amenable to the right hemisphere's take on the world; whereas *logos*, at least in Plato's sense – Heraclitus, for example, had used *logos* to mean a deep understanding *beyond language*, never to mean rationality or rhetoric – is more amenable to the explicit, linguistic, propositional stance of the left hemisphere. We now live in a world where *mythos* has been largely routed, and confined to the fiction shelves. Yet we need to bear in mind that there is more truth about the human predicament in *King Lear* than in any number of textbooks of genetics, irrespective of whether there was ever a King Lear at all.

This distinction between *logos*, the literal and the essentially decontextualised, on the one hand, and *mythos*, the metaphorical and essentially contextual, on the other, is not only grounded in, but maintained by, the difference between the two hemispheres. Most knowledge is not, after all, propositional in nature: it's just that when we look where the spotlight is, that's what we find. We have seen that all the aspects of language that are peculiarly important to poetry – not just metaphor, but implied meaning of every kind – humour, irony, connexions between ideas not normally approximated, the connotative power of symbols, the 'music' of language (the movement of the verse, its ictus, metre and rhyme) – are all preferentially mediated by the right hemisphere. By common consent

over generations, it is poetry which enshrines our profoundest insights into reality. ‘Language halts behind intuition’, wrote Whitehead:

The difficulty of philosophy is the expression of what is self-evident. Our understanding outruns the ordinary usage of words. Philosophy is akin to poetry. Philosophy is the endeavour to find a conventional phraseology for the vivid suggestiveness of the poet.¹⁸⁴

Other philosophers such as Wittgenstein (‘philosophy should be written only as one writes *poetry*’),¹⁸⁵ Heidegger (‘all philosophical thinking, and precisely the most rigorous and most prosaic, is in itself poetic, and yet is never poetic art’),¹⁸⁶ and Whitehead (‘philosophy is akin to poetry’)¹⁸⁷ came to believe that philosophical discourse needed ultimately to have the quality of poetry, as Schopenhauer believed it needed to have the quality of music.

Music is the non-literal form of communication *par excellence*, reliant entirely on metaphorical meaning experienced in the physical frame of the hearer. Music and song are of fundamental importance in human relationships and societies, in bonding at work, in recreation and in worship. There is no known society in which music does not play a pivotal part and in which it is not also thought of as a medium through which one may contact the divine.¹⁸⁸ Birds use song to attract mates, but it is only humans that can synchronise the rhythm, or blend the pitch, of their utterances with that of their fellows. Human music is not, like birdsong, thought to be largely individualistic in intention and competitive in nature (birdsong, like other instrumental utterances, is grounded in the left hemisphere, not, like human music, in the right; *perception* of birdsong by birds, however, is grounded in the right hemisphere).¹⁸⁹ Everything about human music suggests that its nature is sharing, non-competitive.¹⁹⁰ It is the means of group bonding: for good or ill; the communal ‘we’ is also emotionally bound up with song and performance. In all known societies there are acts of communal, synchronous speech and song, in chants and prayers, which recruit right hemisphere regions associated with empathy, and are independent of those implied specifically in the generation and interpretation of language and music: it also seems that in such activities we

do not experience what is said or sung as coming from ourselves, but as being communal utterances.¹⁹¹ There is a continuity in form and function with early poetry in preliterate societies, which was usually accompanied by music, was socially performative, and helped establish and expand common mythologies and narratives, confirming meaning in the deep structures of life, and consolidating the common purpose of the group: *mythos* at work.

Propositional discourse is limited in its ability to approach ultimate reality. Its very terms take us back, as left hemisphere discourse always does, to the familiar. In Nietzsche's phrase, 'language makes the uncommon common'. Philosophical language *requires* a metaphoric and flexible character and thus, according to Whitehead, 'philosophy in its advance must involve obscurity of expression, and novel phrases'.¹⁹² He claims that the history of ideas should be studied with a 'constant remembrance of the struggle of novel thought with the obtuseness of language'.¹⁹³ He later adds that one of the two main problems of philosophy is the 'uncritical trust in the adequacy of language'.¹⁹⁴ Although language is indeed the tool required for philosophy,¹⁹⁵ it is nevertheless a limited servant that should never become the master.¹⁹⁶

However, the rich ambiguity of meaning understood by the right hemisphere is seen by the left hemisphere only as a failing, a lack of precision: it sees there only obfuscation, or at worst, lies. The left hemisphere may add – and it adds enormously much – but what is added must be returned to the world that is grounded by the right hemisphere, or we misconceive the nature of reality. John Quijada, a *Star Trek* fan who studied symbolic logic (the predicate calculus) at university, and whose 'philosophical inclinations are toward an objective/realist philosophy', has invented a language, Ithkuil, which he describes on his website as 'an idealized language whose aim is the highest possible degree of logic, efficiency, detail, and accuracy in cognitive expression via spoken human language, while minimizing the ambiguity, vagueness, illogic, redundancy, polysemy (multiple meanings) and overall arbitrariness that is seemingly ubiquitous in natural human language.' No-one speaks Ithkuil, you will not be surprised to learn. Even its creator takes

up to ten minutes to translate a simple sentence ... much longer if new word-roots/stems are required, as the creation of roots takes

careful thinking and planning ... Long complex sentences can take up to half an hour. It then takes another five to fifteen minutes to look up the rules for writing the sentence in the script depending on the length of the sentence.¹⁹⁷

An artificial language is like an artificial flower – it has no roots: it can teach us nothing. As Heidegger put it, it is not so much that we speak language, but that language, the storehouse of generations of experience, speaks in us. Without the historical perspective of a lived language, we enter a hall of mirrors where our thoughts are simply reflected back to us, without all that penumbra of meaning, tiresome and inexplicable as it may seem to some, that is ‘seemingly ubiquitous in natural human language’. An artificial language is like Hans Christian Andersen’s clockwork nightingale – perfect in its way, unlike the living bird, but meaningless. We tire of the man-made, but not of that which shows human influence, such as a beautiful landscape lived in for generations, the result of civilisation working in harmony with what Pope called the ‘genius’ – the spirit – of the place. A language is like such a landscape, and the languages of different countries, like their terrain, offer different views of the world. Again, we need both to contribute; whereas it is the tendency of the left hemisphere point of view, unlike the right, to want the field to itself.

Myths also have this quality, like language itself, that they do not just derive from one mind alone but from a shared consciousness that stretches over time and place, and are not even consciously – *cannot* be consciously – conceived. The great anthropologist Claude Lévi-Strauss mystified some of his more literal-minded Anglophone colleagues by saying: « *Les mythes se pensent dans les hommes, et à leur insu ... d’une certaine manière, les mythes se pensent entre eux.* » ¹⁹⁸ In other words, it is not that we think up, or think in, myths, but that myths ‘think themselves’ in us all, without our being aware of it, and even in some sense think themselves into being on their own. As Lichtenberg warned, ‘the metaphor is far cleverer than its author, and so it is with many things. Everything has its depths.’¹⁹⁹

We know that the mind is not a *tabula rasa*, a blank slate on which experience inscribes itself from scratch, but comes, as it were, prepared for the encounter it is to have with the forms of the world, including, but by no means limited to, the forms of language. To take a very simple example, the structure of the visual cortex comes fitted and prepared for interpreting the

principal physical shapes and their elements that it will encounter in the world. But that is only a very simple example. What is true of language may be true of the forms of myths, which are remarkably consistent and persistent in space and time: something like Jung's collective unconscious may be acting by means of epigenetics, or by means we may as yet be able only to surmise. The mathematician and logician CS Peirce wrote that 'it is somehow more than a mere figure of speech to say that nature fecundates the mind of man with ideas which, when those ideas grow up, will resemble their father,' – or, as I would prefer to say, mother, – 'Nature.'²⁰⁰

Nowadays our unthinking reaction is to reject any belief or experience whose origins are not known to us: unless we are fully conscious of everything about it and have it under control, it is treated as suspect. But one of the most important aspects of many experiences – such as the experience of love, of art of every kind, of the magnificence and beauty of the natural world, of ancient myths and narratives, of the solemnity of a religious ritual or of an ancient tradition – is that they require us to relinquish control. They speak of something much bigger than us, that cannot entirely be articulated; something ancient and enduring, which speaks, if it can be said to speak at all, *through* us, not just *out* of us. It is an eternal drama in which we each play a humble, but by no means insignificant part – no longer merely in the desolate limelight of our own story, signifying nothing, and reduced to strutting and fretting our hour upon the stage, only to be heard no more. The beauty and power of art and of myth is that they enable us, just for a while, to contact aspects of reality that we recognise well, but cannot capture in words. It is precisely their multi-layered, sometimes paradoxical meaning, well beyond articulation, that gives them value, and makes them resonate with us at so many different levels and in so many different ways.

The more important something is, the more we have to struggle in the attempt to reduce it to language. We would be lost without words, but sometimes it is wisdom to be lost *for* words. Words are always a representation in terms of something else. The work of art exists precisely to get beyond representation, to *presence*, even if that presence is itself composed of words, as it is in poetry. If this were not so, a lot of effort could have been spared, as it could all have been better stated in prose. The work of art does not hide, represent, or body forth something *else*, that must therefore be decoded: it is precisely what it is. And yet neither is it opaque,

as though we were stopped at its frontiers. It is *semi-transparent*, translucent: we see it all right, and yet see *through* it to something beyond.

‘By the way’, said Goethe, ‘the Germans are an odd lot’:

They come and ask what idea I was trying to embody in my *Faust*, as if I knew that myself and could articulate it! ... I am rather of the opinion that with poetic productions the more unparalleled, and the harder for reason to grasp, the better.²⁰¹

Many languages have distinct words for knowing, dependent on the sense in which one can be said to know. In Latin *sapere* is distinguished from *cognoscere*, in French *savoir* from *connaître*, in German *wissen* from *kennen*. In each case the first indicates propositional knowledge, ‘knowing *that*’ such and such is the case, which requires no experience; while the second indicates knowledge *of* someone, some place, or other unique aspect of the world, directly from experience. Ultimately, in fact, all knowledge derives from experience, for which there are no propositions – thus *sapere* bows to *cognoscere*, *savoir* to *connaître*, *wissen* to *kennen*, propositional knowledge to knowledge by encounter. When we say we know something, what we mean is that we see that it is like something else that we reckon we already know better, from a previous encounter. And those ‘somethings else’, followed far enough, return us in every case to embodied experience.

What we are talking about here is a type of essentially *metaphorical* understanding, of which myth, poetry, drama and ritual are all manifestations. In true metaphor the intention must remain implicit; spelling it out causes its richness and emotional impact to collapse, much as explaining a joke makes it fall flat, or paraphrasing a poem reduces it to a series of banalities. It returns us from the ‘presencing’ of the world in language (right hemisphere) to its ‘re-presentation’ in language (left hemisphere). We do not use metaphor to decorate, and therefore obscure, something best conveyed literally (although that would be how the left hemisphere sees it), but to bring to life a deeper and broader set of meanings than could be conveyed by literal language. ‘It would be more illuminating’, writes Max Black, ‘...to say that the metaphor creates the similarity than to say that it formulates some similarity antecedently existing.’²⁰²

All understanding whatsoever is, at bottom, metaphorical. It is not that there is, as *per* Locke, a bed of literal truth, on which metaphorical truth, like a colourful counterpane, is overlaid. It is the other way round. Metaphor is where, as Wittgenstein put it, one's spade reaches bedrock and is turned. Literal truth is something just further removed from experience, taken into the realm of the 'literal', ie, that of letters. Everything has to be expressed in terms of something else, and, as I say, those something elses in language eventually come back to bodily experience. There is nothing more fundamental in relation to which we can understand *that*.

Even words like 'immaterial', 'insubstantial', 'abstract' and 'virtual' refer ultimately to embodied experience. Immaterial comes from the Latin *materia*, meaning 'wood', and even further back, from *mater*, 'mother', in the sense of an origin: the immaterial is that which has no mother. 'Insubstantial' comes from Latin, *sub-*, under, + *sistere*, to 'stand firm': thus something that has nothing standing under it. 'Abstract', as mentioned earlier, is from Latin *abs-*, away, + *trahere*, to 'drag': something that has been dragged away from its 'context' (itself from Latin *con-*, together, + *texere*, to 'weave', ie, 'that which has been woven together'). 'Virtual' comes by a roundabout route from Latin *virtus*, the 'strength of a man' (*vir*). And 'literal' itself? It comes, via Latin *littera*, from a Sanskrit root *li*, indicating something 'daubed' or 'smeared': that's what letters are, after all.

As Lakoff and Johnson point out,

metaphor is centrally a matter of thought, not just words. Metaphorical language is a reflection of metaphorical thought ... Eliminating metaphor would eliminate philosophy. Without a very large range of conceptual metaphors, philosophy could not get off the ground. The metaphoric character of philosophy is not unique to philosophic thought. It is true of all abstract human thought, especially science. Conceptual metaphor is what makes most abstract thought possible. [203](#)

I will come on to the question of whether ultimate reality can be expressed in words at all. By their own accounts, physicists (like mathematicians) tend to think in visual images: to try to appreciate or understand mathematics without visualising it, as physicist Tristan Needham suggests, is like trying to understand music from the score in a

culture where it is forbidden to play or hear it.²⁰⁴ But whenever physicists do express themselves in language, the language is highly metaphorical. One could say the same of spiritual insight: words betray it.

According to Bryan Magee,

direct experience which is never adequately communicable in words is the only knowledge we ever fully have. *That* is our one and only true, unadulterated, direct and immediate form of knowledge of the world, wholly possessed, uniquely ours. People who are rich in that are rich in lived life. But the very putting of it into words translates it into something of the second order, something derived, watered down, abstracted, generalised, publicly shareable. People who live most of their outer or inner lives in terms that are expressible in language – for example, people who live at the level of concepts, or in a world of ideas – are living a life in which everything is simplified and reduced, emptied of what makes it lived, purged of what makes it unique and theirs.²⁰⁵

However, the connotative aspects of language, all that language implies rather than states explicitly, help us get back in touch with the world as the right hemisphere experiences it. ‘The metaphor is perhaps one of man’s most fruitful potentialities’, wrote Ortega y Gasset: ‘its efficacy verges on magic, and it seems a tool for creation which God forgot inside one of His creatures when He made him.’ Metaphor embodies thought and places it, where it belongs, in a living context. In this, it bridges the gap between language and the world, a gap entailed on us by the very nature of language. As philosopher Jan Zwicky puts it, ‘metaphorical language depends on non-metaphorical language the way the art of healing depends on the presence of injury and disease.’²⁰⁶

This is why poetry (which arose historically *before* prose) is so vital to an understanding of the world. Its new conjunctions, its metaphors, its tone, its musical aspects, are all – like music, for most of us – appreciated by the right hemisphere. But in day-to-day speech it is also the right hemisphere that ultimately makes sense of language, and understands an utterance as a whole, in context, with all its non-literal, implicit meaning.²⁰⁷

‘Some words and sentences’, according to the famous literary critic IA Richards,

do seem to mean what they mean absolutely and unconditionally. This is because the conditions governing their meanings are so constant that we can disregard them ... In weighing out a pound of tea we can forget about the mass of the earth. And with words which have constant conditions the common sense view that they have fixed proper meanings, which should be learned and observed, is justified. But these words are fewer than we suppose. Most words, as they pass from context to context, change their meanings; and in many different ways. It is their duty and their service to us to do so ... ²⁰⁸

He called the belief that a word has an ideally single meaning of its own, which dictates the purpose for which it should be uttered, the Proper Meaning Superstition. Unfortunately, when we forget that the stability we think we see depends wholly on the context always remaining constant – as, according to Richards, we commonly do – what is a reasonable practical shorthand assumption becomes a superstition that blocks our understanding. When we think about the world – or time, space or God – and try to make sense of it, we are, precisely, not in those everyday contexts: that’s where the idea of fixed meanings leads to false reasoning.

Recognising this is not a call to abandon rigour, but to embrace it fully. Without a language one can rely on, there is no way of establishing common truths. But a language that is not sensitive to context is dangerously unreliable. You can read a clock precisely, but you can rely on what it says only if the hands are moving in synchrony with the world. A stopped clock is always dependably the same, but almost always dependably wrong. Using language as accurately and clearly as one can (but not a whit more) is to be a custodian of truth in an age where language often seems to be floating free of its moorings in the real world.

Good metaphors are like good jokes: they rely on making unusual connexions. As Zwicky says, ‘Surprise is common to good metaphors and good jokes ... Seeing [a weak metaphor] requires no leap of imagination.’²⁰⁹ A metaphor fails if it is too familiar. Its energy dissipates

immediately and it dies. We no longer see the gap that is overcome. The two parties are either so remote that no 'electrical connexion' can take place, or so close that none is required: in either case, no *leap* of imagination takes place.

Mythos, relying on implicitness, can be responsive and responsible: inextricably bound up with its reception in the mind of the one who hears or sees, it is itself changed by that reception. Relying on explicitness, *logos* is unidirectional: it drives a line of argument, it declares 'how things are', and by so doing aims to fix them. Each has its uses. But note that in metaphor nothing can remain unchanged by the interaction, which is bi-directional, reverberative. When we call a man a wolf, we don't just make the man more wolf-like, but the wolf more human. All knowledge, as Bateson once said, is knowledge of difference – except that it is knowledge of difference within sameness, and sameness within difference: it is only when we see both the sameness and the difference that we can say we know something. Each implies the other. And a metaphor, ultimately the only way to come by knowledge, is an *equal* drawing together of two things in which neither can escape being changed by the encounter.

I may seem to be making too much of this, but the point is important. We think that connexions are causative and temporal, running one way. *Logos* suggests as much. As if to make the point, Lakoff and Johnson, in their book *Philosophy in the Flesh*, in which they establish beyond doubt the grounding role of metaphor in understanding, nonetheless write: 'Does the metaphor fit a pre-existing qualitative experience, or does the qualitative experience come from conceptualising what we have done via that metaphor?'²¹⁰ Surely, neither. This is the old temporal causation problem: in reality it's not a linear relationship, but a betweenness. There is a never-ending reverberative loop set up between the experience and the metaphor, in which neither can be said to have precedence. It is not one of steps, or progress by parts, but one of the co-creation of a new whole.

Coleridge refers to two ways of arriving at truths: sequential, stepwise understanding, in which, as it were, one focusses on one's feet, contrasted with the cultivation of a love for the subject which enables an imaginative seizure of the whole as one steps toward it. Describing how his father introduced him to astronomy as a child, Coleridge writes that he heard him speak of astounding matters far beyond everyday experience without the

least ‘incredulity’, because he was already familiar with tales of the imagination:

my mind was habituated to the Vast – & I never regarded my senses in any way as the criteria of my belief ... I know no other way of giving the mind a love of ‘the Great’, & ‘the Whole’. – Those who have been led to the same truths step by step thro’ the constant testimony of their senses, seem to me to want a sense which I possess – They contemplate nothing but *parts* – and all *parts* are necessarily little – and the Universe to them is but a mass of *little things*.²¹¹

Is it possible to combine ‘knowledge about’ (*savoir/wissen*, the stepwise understanding of the parts) with ‘knowledge of’ (*connaître/kennen*, the awe-inspiring encounter)?

The intellect is ‘incurably abstract’, as CS Lewis says, while experience is intrinsically concrete. How can we have both kinds of knowledge at once – knowledge about, and knowledge of?

You cannot *study* Pleasure in the moment of the nuptial embrace, nor repentance while repenting, nor analyse the nature of humour while roaring with laughter. But when else can you really know these things? ‘If only my toothache would stop, I could write another chapter about Pain.’ But once it stops, what do I know about pain?²¹²

Lewis carries on to suggest that in fact this is the whole purpose of myths. In them we see otherwise abstract truths more clearly, at the very same moment that the experiential reality is brought home to us. The implicit nature of myth, which must never be made explicit, permits it to embody something that, once it is looked at directly, turns into a wraith: it collapses into an abstraction.

The understanding yielded by *mythos* is not an optional extra, a dispensable add-on, an embellishment; but foundational, non-negotiable. It is something intrinsic to our ability to situate ourselves in the world, and to live a fully human life. We become sick without it: ‘mere purposive

rationality’, wrote Gregory Bateson, ‘unaided by such phenomena as art, religion, dream and the like, is necessarily pathogenic and destructive of life.’²¹³ Again I hear Darwin’s poignant complaint that his mind had become a machine for grinding out facts; and that ‘the loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature.’

In truth, we are never without a *mythos* of a kind. In the absence of the celebration of the timeless *mythoi* given us through art and religion, we do not avoid espousing myths of our own making, much impoverished though they must inevitably be: nowadays they are those of the Mindless Machine and of the Selfish Gene.

Louis Sass points out that Wittgenstein saw greater wisdom in mythic than in scientific accounts of the world, which ‘give us the illusion of explaining a world that we would do better to wonder at’.²¹⁴ And he compares Wittgenstein and Freud:

Though [Wittgenstein] is in many respects the deeper sceptic of the two, his is a curious scepticism, profoundly dubious about doubt itself and peculiarly sympathetic to belief. Wittgenstein, who had been trained as an engineer, wrote that he himself found scientific questions interesting, but never really gripping. Hypotheses, cause and effect relationships, even the sorts of insight psychoanalysis could offer: in his view, none of these could address the truly significant issues or existential dilemmas of our lives ... Wittgenstein believed, in fact, that the causal and scientific understanding so prominent in our age often had the insidious effect of *concealing* important questions – by giving a false sense of inevitability and turning us away from the richness and multiplicity of the world. ‘People who are constantly asking “why”’, he wrote, ‘are like tourists who stand in front of a building reading Baedeker and are so busy reading the history of its construction, etc., that they are prevented from *seeing* the building.’²¹⁵

(So *that* was what people did to shield themselves from reality before the invention of the iPhone.)

Knowledge *about* displaces knowledge *of* the world. What we see comes to be our representation of reality, in which there are *things* that we have to learn how to connect, not relationships out of which what we subsequently call ‘things’ emerge. Evelyn Underhill saw how labels become more real than the reality they try to represent, and how such a world is inevitably not just re-presented, but *mis*-represented:

Because mystery is horrible to us, we have agreed for the most part to live in a world of labels; to make of them the current coin of experience, and ignore their merely symbolic character, the infinite gradation of values which they misrepresent. We simply do not attempt to unite with reality. But now and then that symbolic character is suddenly brought home to us. Some great emotion, some devastating visitation of beauty, love, or pain, lifts us to another level of consciousness...

And then it is that we see beyond the ‘neat collection of discrete objects and experiences’ which we have got used to calling the world.²¹⁶

Among the beneficial effects of art and religion at their best are to keep us from wandering aimlessly in this deserted landscape. Jürgen Habermas, formerly unaccommodating of religion, has come to believe that religion must play a large and indispensable part in society:

Among the modern societies, only those that are able to introduce into the secular domain the essential contents of their religious traditions which point beyond the merely human realm will also be able to rescue the substance of the human.²¹⁷

Clearly Habermas is speaking not of the propositional element in religion, but of the *mythos*. Propositions, however intricately devised, are the work of *logos*, and merely get in the way of the process of religion, which is, or should be, about how to find meaning and fulfilment in life, and to help us understand our relationships with one another, with the world at large, and with the divine, however we conceive it.

One important difference between *mythos* and *logos* is that, according to *logos*, knowing how or why something happens appears to exhaust its

nature; whereas according to *mythos*, the nature of something is precisely what cannot even be approached by *logos*. In talking about art, neuroscience seems satisfied with describing mechanisms of perception and offering reductionist accounts of human preference. But it's not just a matter of *preferring* something, like mint toothpaste or a type of handbag. It's not even a matter of accounting for beauty or pleasing emotions, since art cannot be reduced simply to either of these. Philosopher of neuroscience Alva Noë writes in relation to work on the mechanisms of perception:

Some of us might wonder whether the relevant question is how we *perceive* works of art, anyway. What we ought to be asking is: *Why do we value some works as art? Why do they move us? Why does art matter?* ... Far from its being the case that we can apply neuroscience as an intellectual ready-made to understand art, it may be that art, by disclosing the ways in which human experience in general is something we enact together, in exchange, may provide new resources for shaping a more plausible, more empirically rigorous, account of our human nature.²¹⁸

In other words *mythos* is required to help us situate *logos*, not the other way round; since, about *mythos*, *logos* has plentifully little to say. 'Myth is the isthmus which connects the peninsular world of thought with that vast continent we really belong to', writes Lewis.²¹⁹ 'It is not, like truth, abstract: nor is it, like direct experience, bound to the particular.' And he continues, refining its relationship with truth: 'What flows into you from the myth is not truth but reality (truth is always *about* something, but reality is that *about which* truth is), and, therefore, every myth becomes the father of innumerable truths on the abstract level.'²²⁰

The ancient myth of Orpheus and Eurydice has a deep meaning that is relevant to one thread that winds its way through this entire book. Let me remind you of the story in outline. Orpheus was a demigod, his mother being one of the Muses and his father a Thracian prince. His mother gave him the gift of music, and he grew to be such an incomparable musician that all things, both animate and inanimate, were drawn to his lyre. He could move animals and trees, but also rocks and stones, and even alter the course of rivers, by the power of his music alone. He loved a nymph called

Eurydice: and they married. But shortly after the wedding, while she was walking in the fields with her bridesmaids, she was bitten by a viper, and died. Heartbroken, Orpheus resolved to go down into the underworld to rescue her; there he was summoned to the presence of the gods. After pleading his case, he sang, and the gods were so moved that they relented, and acquiesced to his request to take his bride back, though on one condition: that he must not look directly at her while he was leading her out to the upper world again. So he stepped ahead of her on the ascent, and she followed; but at the last minute, when they were almost at the mouth of the cave that led out of the underworld, he could contain himself no longer. He turned and looked at his bride. With cries of joy he ran to embrace her, but she vanished before his eyes, and was drawn back to the underworld, never to be seen by him again.

This is not only, in my view, probably the greatest of the Greek myths, as an account of love, its mysteries and its losses, but is itself an account of *the nature of myth*, as CS Lewis pointed out:

In the enjoyment of a great myth we come nearest to experiencing as a concrete what can otherwise be understood only as an abstraction. At this moment, for example, I am trying to understand something very abstract indeed – the fading, vanishing of tasted reality as we try to grasp it with the discursive reason ... But if I remind you, instead, of Orpheus and Eurydice, how he was suffered to lead her by the hand but, when he turned round to look at her, she disappeared, what was merely a principle becomes imaginable. You may reply that you never till this moment attached that ‘meaning’ to that myth. Of course not. You are not looking for an abstract ‘meaning’ at all. If that was what you were doing, the myth would be for you no true myth but a mere allegory. You were not knowing, but tasting; but what you were tasting turns out to be a universal principle. The moment we state this principle, we are admittedly back in the world of abstraction. It is only while receiving the myth *as a story* that you experience the principle concretely. ²²¹

It makes us feel, as nothing else could do, the dangers of explicitness, and therefore the value of obliqueness: of myth, intuition, poetry, music, and all the other arts, true philosophy, true spiritual understanding, and

every imaginative act whose aim is to offer a glimpse of the elusive nature of reality, not to mention the power of all that body of tacit knowledge without which we begin to lose life. It is the natural counterpoint to the myth of Prometheus, which similarly warns of equally problematic tendencies of the left hemisphere's disposition towards the world: striving to know far more than the human mind can understand, and to control far more than it should, if it is wise, attempt to control. And, once again, if you don't see why, I cannot help you, because if I attempted to grasp its 'meaning' any more firmly and drag it into the light, it would vanish and die.

CONCLUSION

The idea of reason has at least two main meanings: a rigid, abstract, linear mode, prizing precision and certainty, and owed to the left hemisphere; and an embodied ability to hold in suspension knowledge of various kinds justly, and to evaluate them in the context of lived experience, where reason is not in any sense at war with feeling or imagination. This mode is more dependent on the right hemisphere: and is, like the right hemisphere's understanding of science, in my view more fruitful than the alternative that is often served up in its place. And it is vanishing and dying.

LOGICAL PARADOX: A FURTHER STUDY IN LEFT HEMISPHERE CAPTURE

The evil and thus keenest danger is thinking itself.
It must think against itself, which it can only seldom do.

—*Martin Heidegger*¹

THERE IS A PARADOX ENTAILED IN PARADOX. WHAT WE CALL PARADOX IS seen by the purely analytic mind as a sign of an error somewhere – an error which it may be hard to identify, but which nonetheless exists, and must be flushed out and exposed, no doubt by further analysis. Meanwhile, to the imaginative mind it may be a sign of quite the opposite: that we are at last approaching, in one of two possible senses, a deeper level, not of error, but of truth.

The first sense is this: that in the deep (though, clearly, not the superficial) structure of reality opposite truths do actually coincide, and we must therefore accept both. Such a view can be found in, for instance, the writings of Heraclitus and Empedocles, and in the philosophical literature of China and India for millennia; and it was given memorable expression in our own time by the ‘father’ of modern physics, Niels Bohr: ‘it is the hallmark of any deep truth that its negation is also a deep truth.’² I will come to this important topic in the first chapter of Part III, in which I consider the coincidence of opposites. Note that such a realisation does not leave us logically adrift, so that we have to accept that any statement and its opposite must be true. Bohr makes an important distinction: everyday truths

do not give rise to paradox, deep truths do. ‘One of the favourite maxims of my father’, wrote his son Hans Henrik Bohr,

was the distinction between the two sorts of truths, profound truths recognized by the fact that the opposite is also a profound truth, in contrast to trivialities where opposites are obviously absurd.³

Either I had milk in my coffee this morning or I didn’t, but a particle may also be a wave. So far, so good. But what is the second sense? This concerns the structure of the mind and brain: the distinct versions of the world made possible by either hemisphere. As the reader is aware, these have complementary, but contradictory, properties. If, as the philosopher Nicholas Rescher puts it, a paradox is ‘a set of mutually inconsistent propositions, each of which seems true’,⁴ that may be because of differences between the ways in which the right and left hemisphere experience the world. I believe, in fact, that many, if not all, logical paradoxes can be seen as arising from the left hemisphere’s attempt to analyse something that is better grasped as a whole by the right hemisphere. Which is why, unlike insight into the coincidence of opposites, such paradoxes leave us, not illuminated, but puzzled. We *know* that Achilles can overtake the tortoise, yet the more we think about it the more impossible it seems. Much philosophy concerns itself with such paradox. ‘One must not think ill of the paradox’, wrote Kierkegaard with a hint of his characteristic mischief, ‘... the thinker without a paradox is like the lover without passion: a mediocre fellow’.⁵

It is this form of paradox I wish to look at in this chapter: the product of the left hemisphere’s attempt to grasp analytically what the right hemisphere intuitively understands. By such an approach, I hope to generate a new perspective, and perhaps cast some light. And often, as I hope to show, we find evidence of more than one aspect of hemisphere differences operating at once in the same paradox, fitting together coherently, and thus strengthening the argument for the relevance of a hemispheric approach.

In what follows I am not offering ‘solutions’ to the paradoxes I discuss. I am merely pointing out how a hemispheric viewpoint helps to show why they arise. It is worth noting that, according to philosopher Margaret

Cuonzo, as far as the deeper paradoxes go, at least, ‘not much in the way of progress has occurred’.⁶ So *any* light might, I hope, be welcome light.

UNEQUAL TRUTHS

Though I suggest that paradox arises from two conflicting views, each of which has a claim on truth, I will argue that that does not entail the simple conclusion that they have equal claims. If you are uncomfortable with unequal truths, thus with degrees of truth – ‘surely, either it is true or it isn’t?’ – you will be particularly susceptible to being baffled by paradoxes, since one of the many elements that give rise to paradox is, precisely, that there are degrees of truth: not all truths are created equal. This has consequences for apparent contradiction, since a statement and its denial can often be true in different degrees and different contexts. Such thinking is dependent on the right hemisphere: black and white thinking, as you remember, is a predilection of the left hemisphere. Let us have a look at some of the paradoxes that involve such an element, and see what other hemispheric elements they contain along with it.

A number of paradoxes depend for their status as paradoxes primarily on an inappropriate lust for precision. I have mentioned the Quine-Duhem Paradox.

- *Quine-Duhem Paradox.* No hypothesis can be tested in isolation from an indefinite set of auxiliary hypotheses; in order to show that a hypothesis is mistaken, it is necessary to isolate that hypothesis from its set of auxiliary hypotheses; therefore, no hypothesis can be shown to be mistaken.

But conviction comes by degrees. The perception that an apparently mistaken hypothesis might in fact be correct, if we were only prepared to question one of the many auxiliary hypotheses that surround and support it, is hugely important, and is constantly overlooked. But that doesn’t mean that we cannot often be reasonably sure whether a hypothesis is mistaken.

One answer to uncertain situations is to adopt what is known as a Bayesian approach, after an eighteenth-century mathematician and probability theorist, Thomas Bayes. In essence, this involves a sophisticated mathematical estimate of the change in probability added by the new evidence, obtained by contrasting ‘prior probability’ (before taking into

account the new evidence) with ‘posterior probability’ (after taking the evidence into account). Although there is precision to the formula, there is an inevitable lack of precision to the estimate of prior probability, which is based on one person’s idea of the strength of a belief that varies from person to person, and within the same person from moment to moment. Purported accuracy is only as valuable as the accuracy of its antecedents.

Related to the Quine–Duhem Paradox is the Sceptical Paradox.

- *The Sceptical Paradox.* I can know for sure that I am in London only if I can know that I’m not dreaming; I cannot know that I’m not dreaming; therefore, I cannot know for sure that I am in London.

An answer to this is to interpret what counts as knowledge in context, an approach known, indeed, as ‘contextualism’. It entails acceptance of the fact that if you set the bar high enough, we can never be said to know anything. Knowledge is a matter of degree: our standards for ‘knowing’ anything change with context. Demonstrating an everyday matter such as that I am now in London does not demand tiresomely high standards of evidential confirmation. However, proving that I am not dreaming may require such a high standard of evidential confirmation that it cannot be achieved, and we will never know whether, in the words of the title of Calderón de la Barca’s famous play, *Life Is a Dream*.

You will recall William James’s words: ‘more than half the trouble that metaphysicians and logicians give themselves over the paradoxes and dialectic puzzles of the universe’ are due to abstraction from context.

Sensitivity to matters of *degree*, and to *context*, are both areas in which the left hemisphere is handicapped by comparison with the right. The Hedonic Treadmill refers to the fact that we adapt quickly to whatever circumstances we find ourselves in, and that pleasure comes from a *relative* difference of position between ourselves and others, or between ourselves now and ourselves in the immediate past, so that we can end up rich, but always, nonetheless, miserably searching for something further. It shows that pleasure is not attached to the possession of things that supposedly have absolute value (LH), but derives from the context of the web of life, according to which ‘things’ change their value constantly (RH). It is worth remembering that time is a context, and that the left hemisphere appears not

to understand time: this results in the neglect of one of the most important contexts we have. Let's take a look.

An interesting paradox concerns the Unexpected Examination (or, in another version, the Unexpected Hanging).

- *The Unexpected Examination.* A teacher announces to his class at the beginning of the week that at some point in the week he will submit them to an unexpected examination. Apparently this can never occur. This is because clearly it cannot take place on Friday, because by then, not having happened yet, it would be expected. But it can't take place on Thursday either, since this is now the last possible day, and so the same reasoning applies. Nor Wednesday for the same reason, and so on. Therefore it cannot happen at all.

The word 'unexpected' has two meanings here. One is 'unexpected at the moment it happens'; the other is unexpected at the time the announcement is made. The first type of unexpectedness changes in degree, and does so with context, as the week goes on, day by day: on Monday it is one in five, on Tuesday it is one in four, and so on. In other words it changes with time. According to this meaning, what is unexpected only becomes, in a sense, certain, once Thursday is past, and by then the term unexpected has done its work – and the *least* expected day, according to the left hemisphere, turns out to be the very day of the exam:

That day will have been unexpected all along. When it comes around it will, of course, no longer be an unexpected day, for what is now present is no longer unexpected. But the last day *cannot be dislocated from the other days at the time the announcement is made*, except by a kind of theoretical anticipation of actual history, and thus by moving away from the announcement of a possibility to that state of affairs where possibilities are specified and distinguished *one after the other*.⁷

The point being made here by the philosopher Paul Weiss is that the situation cannot be picked apart serially: it needs to be understood as a whole at a moment in time, the moment at which the announcement is

made. From this perspective the date is from the outset uncertain, and to be prepared means, however you look at it, being prepared every single day: whatever the left hemisphere tells you, you will be caught on the hop if you work out cleverly that there can't be an unexpected examination – and it then happens on Wednesday.

Another way to think of the paradox here is that it involves the degree to which imprecision is tolerated. If the teacher were to say 'there may or may not be an examination', the effect would be the same, but the paradox would not arise. The imprecision here has the effect of allowing the meaning of the word 'unexpected' to change with time, in other words with context, and therefore to be more accurate, if less precise. The left hemisphere finds it hard to accommodate such flexibility. A desire for an interpretation that is unambiguously correct at all temporal points lies behind much of the paradox literature, and once again illuminates the handicaps of a certain highly decontextualised, over-precise way of looking at the world. Such paradoxes are fun, but the fun derives from the awareness of how badly (what we can now see as) left hemisphere thinking leads us astray.

We have noticed that the days are picked off *serially*. Then we might notice that this has to be done starting at the end of the time period and working *backwards*. In other words we view the week a slice at a time; and we view it retrospectively, not prospectively as it is lived. For the time being, let us just note these elements – serial analysis and retrospection; their significance will be revealed as the argument unfolds.

Many paradoxes involve the breaking down of a flow into parts or slices. Of these, perhaps the most celebrated cases are the paradoxes of Zeno of Elea, a Greek philosopher of the fifth century BC. He is well known for paradoxes relating to time and space, often inviting the conclusion that motion is impossible. Zeno's paradoxes have tantalised ever since they were first formulated, and have been considered by some philosophers to be simply beyond solution.

- *The Dichotomy (or Division)*. Suppose you wish to leave the room. Before reaching the door you must get halfway there, and before that, a quarter of the way there, and before that, an eighth of the way, and a sixteenth ... and so ad infinitum. An infinite number of

steps cannot be accomplished in a finite time, so no motion is possible, and you are rooted to the spot.

One answer is that a convergent series of infinitely many parts may be contained within a finite number of any size you like. The infinite series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} \dots$ does not sum to infinity, but to 2. The serial analysis of any given step you take is compatible with there being a finite number of steps between you and the door. The problem comes from thinking of infinity as the last in a series of escalating (or diminishing) numbers. But there is no last, and infinity is not part of a series.

The Dichotomy involves a number of elements, but among them there is a *retrospection*: one begins, conceptually, at one's destination and works backwards. This demands that the completed act must be posited at the outset, so that one can talk about its half, quarter and so on. It can be broken down retrospectively into pieces: it can be *analysed*. But it cannot be built up prospectively – that is to say, *created* – from pieces or slices of space or time. It can potentially be analysed *ad infinitum*, but it cannot be created *ad infinitum*. That in turn relates to the issue of wholes and parts: a given whole can be broken down, after the fact, into as many 'parts' as you like, but it cannot be put together from parts, not even as many as you like. That is because the parts, like slices of time or space, are a mental device only: they belong to a left hemisphere *representation*, or fiction. A finite distance is achieved in a finite number of steps: 'the illusion that it is infinite is due to mathematicians who confuse their mathematical *representations* with *what is represented*.'⁸ Or as I would put it for clarity's sake, who confuse the representation with the presence, the left hemisphere's take with that of the right.

This difference in time between the hemispheres – retrospection on something completed (in the left), as opposed to being present moving forward in an always-evolving process (in the right) – is of crucial importance, since what is at stake here is nothing other than the nature of time itself. Analysis is a (1) *fragmentation* into (2) *static* instants of a (3) 're'-presentation, by definition 'after' the fact and (4) *in an abstract realm*; it has all the hallmarks of the left hemisphere about it. By contrast our intuitive understanding takes as an (1) indivisible *whole* (2) the nature of *motion* as it is (3) *present* within (4) *embodied experience*, and has all the hallmarks of the right hemisphere about it.

Consider another space-time problem of a simple kind in which the emphasis is on space, rather than on time: that of how to construct a line. Extension is an irreducible element in our experience of both space and time. Once a line already exists, you can *retrospectively* locate a point in it; but you cannot make a line, *prospectively*, out of points, even an infinite number, since a point by definition has no extension. If you think of a point as a pencil dot, you are cheating, because the dot already possesses extension – it is, in effect, a short line – and you have just smuggled in the very thing you were trying to account for. Similarly a span of time cannot be broken down into instants, because the instant has no thickness. As soon as you allow it the least thickness, it is already a span of time, and you have just imported the element you were trying to account for by putting together instants. An infinity of points or instants will not get you to extension, because the nature of extension, or depth, requires a leap (as the left hemisphere would see it), to something of an irreducibly different nature.

This reminds me of a saying of Kierkegaard, which is invariably misquoted, truncated, and taken out of context, and therefore becomes a banality, to the effect that life is lived forwards but can be understood only backwards: in other words, we see what we were stumbling towards only with hindsight. But this is completely to misunderstand his point, which emerges if one looks at what he actually said in context:

It is perfectly true, as philosophers say, that life must be understood backwards. But they forget the other proposition, that it must be lived forwards. And if one thinks over that proposition it becomes more and more evident that life can never really be understood in time simply because at no particular moment can I find the necessary resting-place from which to understand it – backwards.⁹

He is talking about the rather less obvious point that philosophy *stops time* and *represents* it, retrospectively; whereas when we are living, we experience the world as it happens, in the flow of time. Thus it cannot be ‘understood’ in the sense used by analytic philosophers outside of time.¹⁰

I earlier referred to a closely related, and more famous, paradox of Zeno’s.

- *Achilles and the Tortoise*. The tortoise challenges the famously swift-footed Achilles to a race, and Achilles graciously gives the tortoise a good head start. But Achilles can never catch up with, never mind overtake, the tortoise, since first he must get to the place from which the tortoise started, but by then the tortoise will have moved on; so then he must reach the tortoise's new position, but by then the tortoise has moved on; and so *ad infinitum* ...

The problem here is effectively the same as in the Dichotomy: slicing a flow, seeing a whole as the sum of the parts, retrospectively on what in reality is over in a few seconds and a few strides, and thereby reducing it to segments – a *representation* from which the actual flow of time and movement, what Bergson called *durée*, has been removed, and cannot be recaptured. It is easy to kill something with a knife, but with the knife you cannot make it live again.

Time is represented, retrospectively, along a line, whether that is straight or curved; and it is along that line that time is measured, by taking the difference between two points. Every moment the clock points – at a point: a digital clock equally specifies a series of static points by naming them, however rapidly they succeed one another. But time is not made up of duration-less moments, any more than the line that represents it is made up of points. A point has *no* extension, whether in space or time: that is the whole point about a point.

Note that all the 'building blocks' of the experiential world – space, time, depth, and, I would add, consciousness – are clearly different in kind from anything else, are irreducible, and therefore require a leap: they cannot be approached incrementally. Motion, being reciprocally emergent with space and time, also requires a leap, and can't be crept up on gradually from stasis. There is in fact an ancient paradox, known as the Antinomy of Change, which was discussed by Plato and Aristotle. It both touches explicitly the paradox of how motion arises, and, at a second level, implicitly illuminates the need for what I call a leap in arriving at other irreducibles.

- *The Antinomy of Change*. Imagine an object at rest that then begins to move. At the instant when the movement starts, is it at rest or in motion?

The point is that this paradox applies to change of every kind, and his inability to find a satisfactory answer predictably led Parmenides to deny the existence of change (the world's first great exponent of 'because that's what it says on this piece of paper'). Plato also saw change as a delusion. According to Bruno Snell, Greek science generally lacked a concept of motion: in their enquiries their objective was 'to trace only the constant, static relations ... In the field of optics the Greeks did not pass beyond a geometry of light rays; and their scientific mechanics did not develop beyond statics.'¹¹ This is a profound insight that goes to the core of Platonism, and thence of Western philosophy, for centuries.

Aristotle thought that at the instant when movement starts, the object was neither at rest nor in motion – which is an odd response coming from the person who formulated the law of the excluded middle. It presumably indicates that he was stumped. An alternative response might be that no such instant exists, and that if it did, it would make change impossible. It seems to me that it is more reasonable to accept the existence of change and deny the existence of an instant, which is a theoretical invention, than to accept the existence of an instant and be forced to deny the existence of change, which is a matter of direct knowledge from experience.

'What Zeno shows', as philosopher George Melhuish puts it, 'is that *continuity cannot be composed of discrete elements* even if there is an infinity of them.'¹² It has to be inhabited whole; it cannot be composed from without. Flow is an irreducible, not an emergent, element in the universe.

A further paradox of Zeno's also concerns motion and is more outrageous still, but the same set of considerations apply.

- *The Arrow*. When the arrow occupies a place just its own size, it is at rest. At every moment during its flight, the arrow occupies a place just its own size. Thus at every moment of its flight, the arrow is at rest, and it never moves.

As Bergson writes:

A passage is a movement and a halt is an immobility. The halt interrupts the movement: the passage is one with the movement

itself. When I see the moving body pass any point, I conceive, no doubt that it *might* stop there; and even when it does not stop there, I incline to consider its passage as an arrest, though infinitely short ... but it is only my imagination which stops there ... as every point of space necessarily appears to me fixed, I find it extremely difficult not to attribute to the moving body itself the immobility of the point with which, for a moment, I make it coincide; it seems to me, then, when I reconstitute the total movement, that the moving body has stayed an infinitely short time at every point of its trajectory. But we must not confound the data of the senses, which perceives the movement [RH], with the artifice of the mind [LH], which recomposes it ... You substitute the path for the journey, and because the journey is subtended by the path you think that the two coincide. But how should a *progress* coincide with a *thing*, a movement with an immobility? ¹³

There are a number of hemispheric elements in all three of these paradoxes. First, retrospection is required because we are dealing with a left hemisphere *post factum representation*. It is true that, in the case of the arrow, retrospection does not seem to apply, but only because it is hidden in what is still an exercise in *post hoc* representation of a flight: the path, not the journey. Second, slicing of motion or time produces *stasis*, a characteristic of the left hemisphere's represented world. Third, the left hemisphere believes it can put anything together from *parts*. By contrast, the right hemisphere is dealing with what is *present* and actually experienced; it inhabits *movement* in time and space each of which has depth; and it sees that the *whole* is not the same as the sum of the parts.

On Zeno's paradox of Achilles and the tortoise, Bergson points out that nobody seems to have thought of asking Achilles how he did it. If asked he would have said, 'I don't have to take an infinite number of steps – I am past the tortoise in three strides'. And if anyone were to think of asking me, I'd say I don't have to take an infinite number of steps to get out of the room, nor does the arrow in flight get to be stationary at any point: except retrospectively, in the left hemisphere of the reader.

Note that time and space are always considered together in Zeno's paradoxes. This might be because, as Einstein believed, they were inseparable; but it is more probably because we attempt to understand time

by representing it spatially. That, according to Bergson, is where we make the fundamental error.

Related to this is a paradox promulgated by the Cambridge metaphysician JME McTaggart in 1908.

- *McTaggart's Paradox*. There are two main ways of thinking of time, claimed McTaggart: 'past, present and future' versus 'earlier or later'. The first is time as we experience it, in which the now of presence is constantly changing, and turning what was the future into the past. In other words, my 70th birthday lies now in the future and will one day lie in the past. He called this the 'A-series'. The second is time viewed from such a standpoint that there is no change: what was earlier (or later) will always remain so, however much time moves on. Nothing that can happen now will ever alter the fact that my birth was, is, and always shall be, earlier than my death. He called this the 'B-series'.

He deduced from this that time cannot exist, because (i) in the B-series there is no change, which is essential to time; and (ii) the A-series is self-contradictory, since it can never be true that anything that is in the past can also be in the present and in the future. If you were to object that this is to ignore the difference time makes, McTaggart would respond that that is to invite in the very thing he is engaged in deconstructing and has already shown to be incoherent – unless there is a second A- & B-series to ground the first, in which case the same arguments apply to them, and so a third pair of series will be required ... and so ad infinitum.

Once again the left hemisphere, in whose realm many philosophers seem to do most – or all – of their work, has represented time from a standpoint outside the flow and convinced itself that time does not exist. Just as Zeno demonstrated that, if you spatialise time, you are forever rooted to the spot, Achilles can never beat the tortoise, and an arrow can never fly, so McTaggart was stuck in 1908. Zeno was probably engaged in an amusing *reductio ad absurdum*; but McTaggart was in earnest.

Similar, but different, problems of division occur in a number of other paradoxes belonging to the class of the Sorites Paradox (Greek, *sorites*, a heap). Here, too, we find precision and stasis (LH) pitted against imprecision and evolution (RH).

- *The Sorites Paradox*. One grain of sand is not a heap. At no point does adding a grain of sand make the difference between being a heap and not being a heap. Yet after adding many grains there is a heap.

This has the same structure as a number of other paradoxes, for example that of Baldness (a bald man has no hair; adding a single hair at no point makes the difference between being bald and not being bald; yet after many hairs are added, he is no longer bald); and of Amphibius (a tadpole is filmed at 24 frames a second as it turns into a frog over three weeks; the first frame shows a tadpole, the last shows a frog; there must be a point in the series where a frame showing a tadpole is followed by a frame showing a frog, though only a fraction of a second separates them).

Again one sees a number of familiar hemispheric issues. First, words like ‘heap’ and ‘baldness’ are imprecise, and in this context, so is ‘frog’: they do not have sharp boundaries. To the left hemisphere this is just an example of not having thought clearly enough. Second, and related, there is no room conceded for partial assent (‘it’s getting to be something like what we could call, at a stretch, a heap’; or ‘thinning on top’, ‘balding’, ‘bald as a coot’): the left hemisphere prefers either/or answers. Third, the process of becoming a heap, or a frog, or ceasing to be bald, is turned into a series of sharply delineated individual, in themselves *static*, events – a series of *states*. Fourth, a heap cannot be recognised by enumerating its parts, but only as a whole. All four demonstrate left hemisphere predilections at work.

Fascinatingly, there exist philosophers who argue that, since the principle of bivalence is true (a proposition must be either true or false), there must be a single grain of sand which does make the difference – it’s just that we haven’t found it.¹⁴ I wonder if they also hold that there must be two consecutive frames, microseconds apart, one of which shows a tadpole and the next a frog? Many paradoxes hinge on a (psychologically perfectly understandable, but in my view philosophically mistaken) hungering for certainty.

Strangely enough, some game theory paradoxes arise from breaking down a decision that must be taken globally into what are, locally, logical steps, but which nonetheless lead inexorably to an illogical conclusion. This is a perfect example of what happens when the constrained vision of the emissary replaces the global vision of the Master. A paradox known as the

Dollar Cost Auction involves a series of individually irrefutably logical steps leading inevitably, by logic, to an illogical conclusion. The problem here is local focus and seriality, two cardinal features of the left hemisphere approach.

- *The Dollar Cost Auction.* A dollar is put up for auction, and goes to whoever bids the highest, in increments of 5 cents, however low that bid may be. But, according to the rules of this auction, the under-bidder pays the full amount of his bid and gets nothing in return. What happens is that once embarked on, it is impossible to exit a bidding war in which both parties lose.

The smart strategy would be for one party to bid 5 cents, and the other not to bid at all – and then agree to divvy up the gains fairly. But if co-operation is not allowed, what happens is that each tries by every means to avoid being the under-bidder, so that even winning and making a small loss (by bidding, eg, \$1.05) is eventually better than being the under-bidder, who would have spent a dollar or more for nothing at all. The logic here is symmetrical for either party, and so the game is bound to continue until everyone (except the auctioneer) is worse off than they were: in fact the bidding war will not cease until one party is bankrupt.

This has elements in common with the Prisoner's Dilemma, in which, once again, in the absence of co-operation, each party ends up worse off.¹⁵ There might be a message here that co-operation leads to logically superior results at the global level, even if competition gives the appearance of doing so at the local level. We saw this in the case of biological evolution. And once again, the right hemisphere is better able to see both the *overview*, and the worth of *co-operation* compared with simple competition.

Notice also how infinity has a habit of cropping up in the left hemisphere's version of the world: in reaching the door of the room, in the few strides that Achilles takes in real life to overtake the tortoise, in the regress of 'times' implied by McTaggart. Infinity doesn't actually come into it in real life in any of these cases. It is often entailed by the attempt to reconstruct a flow from slices, and then turn the resulting chain into a continuum. One of Minkowski's schizophrenic patients commented

balefully of his attempt to count endless sequences: ‘that leads toward infinity’.¹⁶

This is true of Lewis Carroll’s paradox of entailment.¹⁷

- *Carroll’s Paradox of Entailment*. Let us make the assertion: (X and Y) entails Z. One person might accept that X and Y are the case, but not accept that their combination entails Z; another might accept that *if* X and Y were the case, that *would* entail Z, but hold nonetheless that X and Y are not in fact the case. So it seems there are two separate propositions being made here, and the overall assertion thus becomes: (X, Y and (if X and Y, then Z)) entails Z. As you can see, this is the start of an infinite regress ...

There are two problems here.

The first is that a self-reference is involved. The assertion about what X and Y entail is on a different level from the assertion of X and Y themselves. So asserting the facts of the case – ‘it is raining’ and ‘rain makes you wet’ – is on one level; asserting that if these are the case they imply that ‘you are wet’ is not a statement of fact, but a matter of logic implicit in the syntax of the sentence. It is a meta-proposition, which should not be included in the very propositions to which it refers and on which it operates. I will come to paradoxes of self-reference shortly.

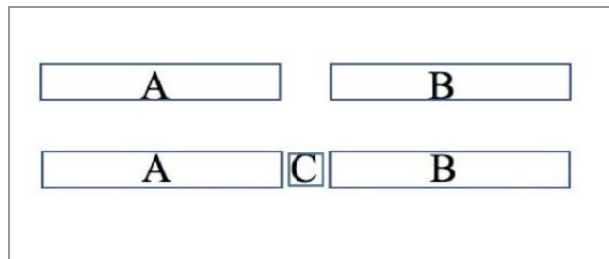
Carroll’s logical case shares an important structure with the Third Man Paradox, owed to Plato and discussed in its ‘Third Man’ form by Aristotle. Plato was honest enough to confess that it looked like an argument against the existence of Forms (themselves characteristic of left hemisphere thinking).

- *The Third Man Paradox*. According to Plato, Fred and Harry are alike, as ‘men’, because they each share the qualities of the Form of a Man, which must itself have all the qualities that Fred and Harry have. Thus, there are three elements that are alike: Fred, Harry and the Form of a Man. But how to explain their likeness? For this, there must be a further Form – call it the Superform of Man – which explains the likeness of each of the three to each of the others. So now we have four items: Fred, Harry, the Form of

Man, and the Superform of Man ... and you see where this is going.

This seems to me a consequence of creating an abstraction, and reifying it; thus ‘thingifying’ a mode of being, which is not a noun or a thing, and setting it on the same level as the supposed ‘things’ to which it itself refers.

So, first, there is a problem of self-reference. The second problem follows from believing the world to be made of wholly discrete elements, not overlapping patterns or flows. In trying to form connexions between discrete elements, the new connexions themselves need to be connected by a further overarching connexion, and so on, a point made in different forms by Bergson and James about the irreducibility of flows to chains. If A and B are wholly distinct, I have to yoke together A and B by means of a joining element C. The result is that where there was once just one pair of ends to join (the opposed ends of A and B), there are now two pairs, the opposed ends of A and C and the opposed ends of C and B:



As this process is repeated, in the attempt to unify the pieces of a chain, instead of the gaps being eliminated, they multiply without end. I hardly need to point out the hemispheric significance of this since it has been constantly emphasised in earlier chapters. This was formalised as a paradox by FH Bradley.

- *Bradley's Paradox of Relations.* If A and B are two terms that are connected, they are necessarily connected by some relation C. Equally for C to act as a connection, it must in at least some respect differ from each of A and B. Yet C can only relate A and B if there is some connection between A and C and between B and C;

so there must be new relations D and E to explain these connections ... and so ad infinitum.

It demonstrates beautifully that continuity can be disrupted, but cannot be created without some sort of leap. Continuity, like extension in space or time, cannot be put together, only taken apart.

Here I wish to quote James, because the passage is so much more revealing than anything else on this subject:

Suppose ... many distinct beings *a*, *b*, *c*, etc, to exist independently of each other: *can a in that case ever act on b*? What is it to act? Is it not to exert an influence? Does the influence detach itself from *a* and find *b*? If so, it is a third fact, and the problem is not how *a* acts, but how its 'influence' acts on *b*. By another influence perhaps? And how in the end does the chain of influences find *b* rather than *c* unless *b* is somehow prefigured in them already? And when they have found *b*, how do they make *b* respond, if *b* has nothing in common with them? Why don't they go right through *b*? The change in *b* is a *response*, due to *b*'s capacity for taking account of *a*'s influence, and that again seems to prove that *b*'s nature is somehow fitted to *a*'s nature in advance. *A* and *b*, in short, are not really as distinct as we at first supposed them, not separated by a void.¹⁸

The necessary preadaptation to *b* on the part of *a* – that what we take to be parts are already situated in a coherent whole – is an idea with which the reader will be familiar. For there to be a connexion between two entities there must be both a degree of difference *and* a degree of similarity.

These paradoxes should be distinguished from a quite different problem which arises through the business of representation, and then reifying our representations – both left hemisphere tendencies. We encountered it in the case of McTaggart's Paradox. He removes the force or movement from time, in representing it as a series extended in space (his series B); this means he needs to motivate the series (get it moving) by importing a second-order time (his series A), which might impart the essential quality of change, somewhere beyond or beneath it. And that then requires a third-

order time for the same reasons ... and so on. Similarly, there is a Paradox of Place, which was promulgated by Zeno.

- *The Paradox of Place*. Everything that exists has its place; place exists; therefore place too must have a place, and that place have its place, and so ad infinitum.

Here what seems to be happening is that the left hemisphere, dealing with representations rather than experience, finds itself in a hall of mirrors, in which a representation is represented by a further representation, which is represented by a further representation, and so on. Hardly surprisingly this paradox is bound up with the left hemisphere's version of language, whereby words are taken for the *things* they represent: a tool of representation.

Take the example of a paradox promulgated by Quine.

- *The Morning Star Paradox*. Both the Morning Star and the Evening Star are the planet Venus. But one has properties that the other doesn't have (such as appearing in the morning or the evening). Are they the same or different?

For our purposes it draws attention to two hemispheric traps: believing that naming a thing in two different ways might make two different things, and a reluctance to see that the same entity can appear at different times in a different phenomenological guise without losing its identity. This reluctance has something in common with Capgras syndrome, which as we have seen, is caused by a right hemisphere deficit: my wife in the morning is different from my wife in the evening because time has elapsed and she looks subtly different. Things, according to the left hemisphere – which invented them – don't change, because, remember, to the left hemisphere change doesn't exist. So when something does appear in two different lights, it implies, to this way of thinking, two distinct things.

Another kind of paradox also seems to hinge on the left hemisphere's tendency to see a name as a thing. An example is Kripke's Pierre, named after Saul Kripke who first promulgated it.

- *Kripke's Pierre*. Pierre, a Frenchman who has never been to England, has heard that '*Londres est jolie*'; so it could be said that he believes London to be pretty. Later he finds himself in a district of a foreign city, whose language he learns from those around him, and finds it is not pretty. He gathers the city's name is London, but makes no connection with the *Londres* of which he heard so much. As a result, he seems to believe that London is both pretty and not pretty.

From one perspective, until he is told that *Londres* and London are the same place, he does not have contradictory beliefs. Once told, he is free to reconcile them in any way he wishes – by, for example, telling himself that his experience of one area of London was not typical of London as a whole, or that London has changed since he first heard about it, or that he has better taste than his parents and friends, or that it is a curate's egg, or in a host of other ways. I would suggest that from a hemispheric perspective, though they operate in different ways, this and the Morning Star Paradox suggest the left hemisphere's difficulty in adequately distinguishing language from experience.

Then there is:

- *The Paradox of Negation*. To state that, eg, 'unicorns don't exist' is to imply the existence of something called a unicorn at the same time as denying its existence.

Once again, while one interpretation of the grammar is that I am affirming and then denying the existence of something, anyone familiar with how we use language will surely know that not everything we think corresponds to reality, and so neither does our language. By naming something, I do not bring it into being. We have words for ideas and images that we may know do not exist – or which we believe exist, though they don't. Once again an exaggerated notion of language as *constituting* reality, the natural position of the left hemisphere, seems to be part of the problem. According to Parmenides, you can speak only about what is: what is not cannot be thought of and what cannot be thought of cannot be. All three statements are false, it seems to me. As with almost everything that

Parmenides says, one is brought up sharply against the falsity of the left hemisphere.

Parmenides' position casts light on why Greek mathematics was never able to use 'zero', a concept they lacked and which was later derived by the seventh-century Indian mathematician, Brahmagupta. He recognised the significance of zero as an entity in its own right, thereby expanding the possibilities of mathematical calculation. Zero, he saw, was the result of combining any number with its negative counterpart: not just an absence, then, but the positive presence of x with $-x$. By doing so he made possible the development of modern mathematics.

Here let us consider a paradox promulgated by GE Moore.

- *Moore's Paradox*. Take a statement of the form ' x [where x is any statement, eg, 'this table is almost entirely empty space'], but I do not believe x '. The paradox here is that such statements appear absurd but are not necessarily untrue or contradictory.

There are a number of ways in which such sentences are not necessarily untrue or contradictory. All are illuminated, in my view, by a hemispheric analysis.

First, to the right hemisphere, it is taken for granted that what we say can only ever approximate a part of what we think or feel: to the left, which does the speaking, there is a greater temptation to imagine that words are the whole reality. Second, to the right hemisphere statements of belief are less purely cognitive and may take into account different levels of thought, feeling and experience. Third, to the right hemisphere, which is more in touch with our unconscious selves, it is easy to see how the same person may embody different levels of belief at any one moment in time. Similarly, it is also (eg, Capgras phenomenon, again) harder for the left hemisphere to see that multiple facets of the same person may exist together, and/or may change over time, without that person's personhood being at stake. In the words of Walt Whitman: 'Do I contradict myself? / Very well then I contradict myself, / (I am large, I contain multitudes.)'¹⁹ And fourth, there is the usual hemispheric difference in assent to *degrees* of truth – *partial* beliefs – ambivalence. Not to mention simply the left hemisphere's relative bafflement because of its poorer understanding of the complexities of human nature.

This relates to another paradox:

- *The Paradox of Self-deception*. How can one deceive oneself about something one knows to be false?

The correct response to that is: ‘very easily’, and I do not need to repeat the points made above. Denial – self-deception – is, as we have seen, a characteristic of the left hemisphere, so the supposed impossibility of self-deception may be in itself a form of left hemisphere denial – a denial of denial. But more than that, we are multiply stranded, and multiply layered, beings. The Paradox of Self-deception founders on believing that we are single and wholly conscious. To quote Montaigne: ‘within ourselves we are somehow double creatures, with the result that what we believe we do not believe, what we condemn we cannot rid ourselves of.’²⁰ So we may say: ‘I know I’m dying, but I can’t believe it’; ‘I am fearful of ghosts, but I don’t believe in them’; ‘I believe I’m fated, yet I know fate cannot be a reality’. My favourite is the remark reportedly made by Niels Bohr:

A friend was visiting in the home of Nobel Prize winner Niels Bohr, the famous atom scientist. As they were talking, the friend kept glancing at a horseshoe hanging over the door. Finally, unable to contain his curiosity any longer, he demanded: ‘Niels, it can’t possibly be that you, a brilliant scientist, believe that foolish horseshoe superstition?!’ ‘Of course not’, replied the scientist. ‘But I understand it’s lucky whether you believe in it or not.’²¹

Also related is

- *The Paradox of the Preface.*²² A writer may say, in the preface to his work, that ‘there will inevitably be errors’ in what he writes, but presumably believes that everything he writes is correct, otherwise he wouldn’t have written it.

Not for the first time, it is hard for a non-professional philosopher to believe that this counts as a paradox, but to the extent that it does, it must do so because of three criteria of interhemispheric difference: the *telescoping of time* by the left hemisphere, so that the present (the moment of the assertion) and future (when the envisaged mistakes will become apparent) are ‘flattened’; the conflating of a *general* truth with *particular* truths; and the loss of *gradation*, so that truths are now absolute.

It is evident that many paradoxes involve self-reference. We have seen several already. The most famous of these is the saying of Epimenides the Cretan, that ‘all Cretans are liars’: false if true, and true if false.

The most obvious response to such a paradox is that few statements apply inflexibly to every case at every moment in time. The right hemisphere doesn’t conflate the particular remark, which has a context, with an absolute, context-free proposition. In the real world, no-one reflecting that all Cretans are liars imagines an audience to understand that every single statement ever made by any Cretan was and is a lie. This is clearly an impossibility for a single functioning human being, let alone for a people that have been continuously civilised for nearly 5,000 years. Only someone who was autistic, or had some other form of right hemisphere deficit, could be expected to believe the remark in this absolute sense. On this I feel like Wittgenstein:

... it is very queer in a way that this should have puzzled anyone – much more extraordinary than you might think: that this should be the thing to worry human beings. Because the thing works like this: if a man says ‘I am lying’ we say that it follows that he is not lying, from which it follows that he is lying and so on. Well, so what? You can go on like that until you are black in the face. Why not? It doesn’t matter.²³

More interesting is to consider the *shape* engendered by the remark. If one sees this as a circle – if one flattens the plane of the argument – it makes no sense. But the meaning here is rich and has many levels. In three-dimensional, rather than two-dimensional, space, it is not *circular*, but has the structure of a *spiral*, in which the returning loop avoids re-entrance.

Let me be more explicit. One way of understanding the remark – which comes from a poem or song, and was probably humorous in intent – requires, as we have agreed, abandoning an inhuman, po-faced literalism, and understanding what goes on in another's mind (not a strength of the left hemisphere). After all, Epimenides was a man, not a computer. Epimenides, I suggest, knows that you know that this remark creates an absurdity, if he is to include himself as a liar. And so he seems to be exempting himself, making himself better than his fellow Cretans. In doing so he is also acknowledging that you know that that is what he is doing, and the very act of doing so risks exhibiting a lack of self-knowledge (boastful ignorance), which he is also mocking in himself. But by the act of mocking himself, he exhibits that he has self-knowledge at a still higher level. The humour comes from the 'I know you know I know' complexities involved (the phrase – more fully, 'I know *that* you know *that* I know *that* ...' – implies embedded levels of meaning, a more explicit playing out of levels, not just elements on the same level). By means of this, he draws attention to the sort of claims one cannot make about oneself – such as 'I am wise' or 'I am humble' – without self-defeat. And in doing so he leaves open the possibility that he may be wise and humble, while laughing at it and himself, at the same time, and suggesting he is probably neither. Leaving it to you to redress the balance. There! All of that so economically implicit, and understood by the right hemisphere; while according to the left hemisphere the statement simply 'does not compute'.

You could think of the two approaches here like this: the literal one is two-dimensional and therefore issues in a circle, while the nuanced one is three-dimensional, the circle becoming a spiral. The left hemisphere world is hermetic, so one 'hits one's head on the ceiling', so to speak, and can go no higher. But, according to the right hemisphere, to which all frames of reference are open, there is always another level to which one can go to ask a question that *transcends the frame of reference*. This difference of spatial depth, even if the space is a cognitive one, differentiates the two hemispheres.

One way of seeing the Liar Paradox is that two cognitive-linguistic planes are involved. The state of affairs described by the sentence has to be on a different level from the sentence itself (in this it is like Carroll's Paradox of Entailment). At one level language is being used to refer to a state of affairs outside language; at the second level, another statement is being made, from a higher level, about the statement itself, as a piece of language. In the first situation language is commenting or referring elsewhere, as it usually does; in the second situation, language is referred to from inside itself. These distinct levels are flattened, as though a spiral was squashed to a circle.

Yet another way of seeing it is that two temporal planes are involved. Thinking temporally, the sentence refers to a time before the pronouncement is complete – up until this speech event takes place. Then there is a second temporal context. The paradox results when the two distinct times are conflated.

Take another paradox of self-reference.

- *The Paradox of Euathlus*. Protagoras taught his impoverished student Euathlus the law on the basis that Euathlus would repay his teacher as soon as he won his first case. Euathlus decided not to pursue a career in law, and so did not repay Protagoras. Tired of waiting for his money Protagoras sued him for it. He reasoned that if Euathlus lost his case before the court, he would have to pay; and if Euathlus won his case, he would be bound to pay according to the terms of their agreement. However, Euathlus reasoned with equal force that if the court found in his favour he would not have to pay, and if it didn't he would still not be obliged to repay Protagoras, since he would not yet have won a case.

Here again the problem is self-reference, but it could be seen to resolve if one is careful to distinguish two different temporal contexts. At the moment the court makes a decision, both men are bound to abide by it. Suppose that the court favours Euathlus: Protagoras has lost his money. But only for now: if he then sues Euathlus a second time, he is almost certain to win, since Euathlus has clearly already won his first suit.

There are a number of self-referential paradoxes, most of which resolve if one is clear that distinct levels of language are conflated. To make a

statement A about a situation, and to make a statement B about the language in which statement A was made, are two different kinds of thing. However, some paradoxes are deliberately set up in such a way that language must refer to itself. An example is Grelling's Paradox.

- *Grelling's Paradox*. Developed by the early twentieth-century German logician and philosopher, Kurt Grelling, it involves referring to words that describe themselves, such as *short*, and *polysyllabic*, as autological, by virtue of the fact that *short* is a short word and *polysyllabic* is a polysyllabic word. Those which don't, such as *long*, and *monosyllabic*, are called heterological. Is the word heterological heterological? If yes, it isn't; if no, it is.

From a hemispheric point of view, language becomes itself an aspect of reality in the left hemisphere: 'what it says on this piece of paper' becomes as real as (indeed, more real than) the world of experience. The left hemisphere lives in what I have characterised as a hall of mirrors, in which it doesn't so much know the world by direct experience as know its own knowledge of its own knowledge of its own knowledge ... so that its thought becomes untethered from reality and highly self-referential.

Much of Magritte's work plays with levels of reference and the relationship between presence and representation. In *La Belle Captive*, the frame on the easel contains something that looks like a representation of the seascape in front of the viewer, so placed as to overlap with it exactly (see Plate 15). Is it, or is the frame merely empty, the seascape continuously present? The fact that the living fire surreally breaking from the tuba on the beach creates a glow on the area within the frame suggests a third possibility: that it is a blank piece of glass – something we need to see *through*. And in a painting such as his 1949 version of *Le Domaine d'Arnheim* (he repeatedly approached this visual conundrum from different metaphysical angles), the glass in the window is not blank but holds an exact painted representation of the scene beyond the window, revealed in the shards that have fallen on the floor.

The most famous modern paradox of self-reference is Russell's barber.

- *Russell's Paradox of the Barber.* In a certain village there is a barber whose rule it is to shave all those, and only those, who do not shave themselves. According to this rule, if the barber shaves himself, he must not shave himself; but if he does not shave himself, he must.

Notice that this works only if there are rules, that is to say *inflexible* rules. This is the left hemisphere mindset, and that is fine. What is worrying is that it is the world in which, guided by machine thinking, we are all increasingly expected to live.

Self-reference is sometimes endlessly generative and sometimes leads to a dead end. This is a case that is impossible: the barber cannot exist (if he is to abide rigidly by the rule). In this it is like the statement 'this statement is false': the statement cannot meaningfully be made. Garbage in garbage out. Yet the paradox has important implications to do with completeness. While it is fatal to the aspiration for a complete, closed system, it is not to an open one. In other words, the paradox demonstrates that following the consistent procedures of logic will always fall short of completeness, and any enclosed, self-referring system the left hemisphere comes up with, if taken strictly on its *own* terms, self-explodes: there is always a member of the system that cannot be accommodated by the system. There is always a way out of the hall of mirrors.

Let us turn to some paradoxes involving specifically the relationship of wholeness and parts. The best known of these is the so-called Ship of Theseus Paradox.

- *The Ship of Theseus Paradox.* According to Plutarch, 'the ship wherein Theseus and the youth of Athens returned had thirty oars, and was preserved by the Athenians down even to the time of Demetrius Phalereus, for they took away the old planks as they decayed, putting in new and stronger timber in their place, insomuch that this ship became a standing example among the philosophers, for the logical question of things that grow; one side holding that the ship remained the same, and the other contending that it was not the same.'²⁴

The ‘logical question of things that grow’ (*auxanomenos logos*), or Growing Paradox, refers to the argument that, since the cells (and for that matter, the constituents of cells) in all living things are constantly being lost and replaced, no organism is the same from year to year, or indeed even from moment to moment. Thought of as Novalis’s moulded rivers, or living streams, we could be seen either as the same, or not the same, like the Ship of Theseus: but in view of the way in which living things only remain the same through change (see Chapter 12), we would not normally deny continuity on this basis. In the case of the ship, to the right hemisphere, which sees the whole, the *Gestalt* has not changed, and the ship is still the Ship of Theseus; that a thing changes as it evolves is taken for granted. To the left hemisphere, which puts the ship together from its parts, it is not; when the parts change, it becomes something else. Those who find it difficult to see what the right hemisphere sees, such as people with schizophrenia and some kinds of autism, tend to doubt that they are the same person from moment to moment. This comes together with time-slicing, since both an inability to see that the whole is not the sum of the parts and the belief that flow can be sliced are aspects of the left hemisphere mindset.

Philosophers with such casts of mind run into the same problem. Descartes displays an essentially schizoid personality. He was an example of both extreme left hemisphere credulity (animals are merely machines and feel no pain, despite their cries when dissected) and left hemisphere scepticism (I have no continuity of existence; other people may be simply automata). ‘It does not follow from the fact that I existed a little while ago’, he wrote in his *Meditations on First Philosophy*,

that I must exist now, unless there is some cause which as it were creates me afresh at this moment ... it is quite clear to anyone who attentively considers the nature of time that the same power and action are needed to preserve anything at each individual moment of its duration as would be required to create that thing anew if it were not yet in existence ...²⁵

and he continues in the ‘Objections and Replies’:

there is no relation of dependence between the present time and the immediately preceding time ... the individual moments can be separated from those immediately preceding and succeeding them, which implies that the thing which endures may cease to be at any given moment.²⁶

So he argued in the seventeenth century.²⁷ And Derek Parfit argued a still more extreme position, in relation to the non-continuity of the person, in recent years.²⁸ In contrast to which I would urge the words of Bergson: 'I believe that our whole physical existence is something just like this single sentence, continued since the first awakening of consciousness, interspersed with commas, but never broken by full stops.'²⁹

A more intriguing version of the paradox can be entertained. Suppose someone kept all the rejected timbers as they were discarded piecemeal, and reconstructed them into a ship: which would now be the Ship of Theseus? If they each have a claim, are there now two Ships of Theseus, or just one, the issue of precisely *which* being undecided? Does the fact that in one case changes have been made only incrementally, without the *Gestalt* being lost at any point, make a difference? Suppose, then, that that ship is loaned to a museum, and is taken apart, and the pieces numbered and then reconstructed on arrival – is its claim for priority over the ship reconstructed from the old timber weakened? Why would the one that is reconstructed from new timber be *more* authentic than the one that is reconstructed from the original timber? And if the claim of the repaired ship is weakened by being taken apart, is there a moral argument against sending it on loan?

In such puzzles, where the whole is not living, but put together from parts, the left hemisphere and right hemisphere point of view seem equally to have something to be said for them. However, in the case of the ship reconstructed from the old parts, the situation is different: the one preserved in the harbour, in which new parts have been substituted, has *Gestalt* only: the one made from the salvaged parts has *Gestalt* plus parts, so that, on the face of it, it has more of a claim to be the original. But against that is the consideration of the difference between something that has gradually changed against something that had to be built up from scratch. We want to make a distinction there: for example, we would prefer the serially repaired

ship, even when it no longer contained any original pieces, to a replica made from scratch from new wood. Why? Presumably because we treat such a treasured object as having a history and fate shared with living things – caught up in the life of those whose narrative it shared; and to that extent we liken it to an organism. And in the case of organisms – those ‘things’ to which the Growing Paradox applies – it seems to me clear that the right hemisphere point of view is the more reasonable: I am still I (though changing, as every living being is), and the substitution of cells does nothing to invalidate the fact. It is the *Gestalt* that trumps all here, not the ‘parts’ out of which it is made. To reverse that in the case of living things is tantamount to rendering them inanimate.

Yet, as we now know, even non-living things, such as rocks, are pure *Gestalt*, since the constituent ‘parts’ are, at the atomic and subatomic level, in perpetual flux. *Everything* flows, and *at the same* time the flow keeps forming temporary *Gestalten* within the flow. There are distinguishable entities within a resonant whole. All this the right hemisphere is better equipped to understand. And here there is an intimation that the boundaries between the living and the inanimate are not as watertight as they are often assumed to be.

Let me conclude by touching on the two most problematic categories of paradox, those that involve time travel and/or future knowledge, and those that directly concern infinity.

Typical paradoxes of the first kind go like this.

- *Paradox of Prediction*. If you had certain knowledge of the future, you could take action in the present to alter events in such a way as to invalidate that knowledge.
- *Flint’s Paradox*. If you had both certain knowledge of the future and could travel into it, you could take action in the future to alter events in such a way as to invalidate that knowledge.
- *Grandfather Paradox*. If you could travel back in time you could kill your own grandfather when he was a child, so that you could not exist to travel back in time – so your grandfather would live, and you could be born to travel back in time and kill your own grandfather when he was a child ... and so ad infinitum.

These and similar paradoxes merely demonstrate the impossibility of certain future knowledge or time travel. I suggest that the problem arises because time, which is present to the right hemisphere, is re-presented as a sequence of events to the left hemisphere. Once it is laid out on paper, to know the future we need only look further along the line to the right, and to travel back in time we would need only to move our gaze to the left.

Thus spatialising time leads to paradoxes by encouraging retrospection, from some future imagined standpoint, on what can only be understood from the standpoint of the present (as in, for example, Zeno's paradoxes) or projection forwards to some future imagined standpoint of what can only be understood from the standpoint of the present.

An intriguing paradox involving prediction is Newcomb's Paradox.

- *Newcomb's Paradox.* Two boxes are on a table. Some (virtually) omniscient entity, Omega, has put \$1,000 in one box (A) and either nothing or \$1,000,000 in the second (B). It has done so on the basis that if it predicts you will choose just box B, the box contains \$1,000,000; if it predicts you will take both, it has put nothing in it. It has an astonishingly good track record of being right. Rationally speaking, should you take both boxes or just box B – bearing in mind that by now nothing can alter what is in the boxes, so that on the face of it you cannot possibly lose by taking both?

Mathematicians and philosophers divide pretty evenly into 'one-boxers' and 'two-boxers'. That is perhaps because there is no way of evaluating a situation that cannot exist. Accepting the omniscient being is like accepting that the porcupine is a monkey: any conclusion drawn from such a premise is invalid. I suppose it could be argued that there might come a time when a computer was so good at assessing your personality that it knew whether you were almost certain to be a one-boxer or a two-boxer. In that case the 'paradox' would simply become a matter of assessing, on the basis of everything else you know about the world, the weight to attach to the improbable claim – the being's track record might be a scam, or wrongly reported, or the result of a lucky streak, all of which are frequent causes of error in life, whereas no claim of infallibility has ever yet been validated. The left hemisphere takes one box, since it believes 'what is written on this piece of paper'; the right hemisphere takes two, if on taking a look at the

claim, it figures the claim is unlikely to hold – ‘the porcupine is not a monkey’.

Incidentally, in the case where Omega is a very efficient computer that can tell with astonishing accuracy whether you are a one-boxer or a two-boxer, you could game the situation by recognising that you are a classic one-boxer and deciding on this occasion to take two. To get round that Omega would have to know not just your boxing tendencies, but your cheating ones as well.

However, I suspect that the reason that there are as many one-boxers as two-boxers is not so much that people divide neatly into one of two groups, but that they are of two minds – sometimes favouring one-boxing and sometimes two. That would apply to me, at any rate. That we are inconsistent seems to have been forgotten, as in Moore’s Paradox.

And so to problems of infinity. The mathematician JF Thomson described the following paradox:

- *Thomson’s Lamp*.³⁰ If a lamp could be switched on and off an infinite number of times, each act of switching taking half the length of time of the previous one – the first lasting a minute, the second half a minute, the third a quarter of a minute (‘Zeno fashion’) – at the end of the two minutes that it would take to complete the series, would the lamp be off or on?

It could not be off, because every act of switching off is followed by one of switching on: and it could not be on, because every act of switching on is followed by one of switching off. There is no solution to this, except to declare the task not just practically but intrinsically impossible. This is an answer that is more tolerable to the right hemisphere than the left, because it involves accepting that some things can never be decided, and that some things can never be accomplished. As Margaret Cuonzo says, speaking of Kant’s antinomies: ‘although both antinomies are the result of trying to go beyond the limits of our reason, it is nevertheless inevitable that reason’ – for which, here read the left hemisphere – ‘will attempt to overreach its limits.’³¹

There are limits to our reasoning when applied to the stuff of reality, and this includes, but is not confined to, dealing with infinity. There is an

incompleteness intrinsic to mathematics when applied to the real world, where there are only irregularly curved surfaces and planes, not ideal rectilinear ones. A curved line has fundamental properties distinct from a straight one. Just as there is no way you can get to extension in space or duration in time by the amassing of infinitesimal points or slices, there is no way you can get to a curve using straight lines: you can approximate it with evermore tangents but never actually achieve a curve. A polygon with as many sides as you like never actually becomes a circle, though it approaches it asymptotically. A mechanised doll may be as lifelike as you can make it, but it will never actually live. The process in each case, the process that *doesn't* work, involves putting things together. In every case what can only be called a 'leap' has to be made from one realm into another, to bring it to life.

It's not just calculus (which is a rectilinear method of assessing non-rectilinear spaces that has to quit at some point), it's true of any curve, including a circle or sphere, since π is an irrational number, that is to say one that never resolves but goes on for ever. I am reminded again of Einstein's saying, 'as far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.'

A 'leap' becomes necessary, I believe, not because of some disjunction in reality, but because of an incompatibility between the 'truths' that our two hemispheres hold. Bergson himself puts his finger on it when he contrasts the roundness of intuition with the rectilinear nature of logic. He says of the logician: 'Having in fact left the curve of his thought, to follow straight along a tangent, he has become exterior to himself. He returns to himself when he gets back to intuition.'

The profound fifteenth-century philosopher, mathematician, theologian, scientist and general polymath Nicholas of Cusa (often referred to as Cusanus), thought that truth is not a thing like other things, or put together from other things: it is irreducible. We can't arrive at more than an approximation to it, using what he called the intellect (effectively the analytic left hemisphere), much as a straight-sided figure cannot ever quite achieve a circle.

Leibniz, who invented integral calculus to deal with the problem of areas under a curve by endless approximation, said that we cannot step across the gap from finite, measurable spaces to the whole infinite space – to get across would require a leap. 'How slippery', he warned, 'are our

thoughts on infinity’.³² In order for asymptotes to meet, in order to move from the finite to the infinite, a leap is called for. And as he put it, ‘we cannot leap over’ by the unaided intellect.³³

This corresponds to Galileo’s explanation that the infinite cannot be reached by a successive progression of steps, but only ‘at a stroke’.³⁴ Galileo’s key perception was that the supposed endpoint of the sequence cannot be just *a special element of the sequence* itself, and similarly that an infinite number is not a special case of the finite numbers. David Hilbert was to say of infinity:

Instead of the old principle *natura non facit saltus* [nature does not make jumps], we might even assert the opposite, viz, ‘nature makes jumps’.³⁵

This leap is makeable by imagination but not by analytic reason. Infinity cannot be reached by continually adding another number to the series, or prolonging length or time indefinitely. An idea that is difficult for many people to grasp is that a line prolonged to a length of billions of billions of light years is no nearer infinity at the end of the process than when it was a thousandth of a millimetre long. To understand infinity we have to make a leap: you can’t get there by continuous movement from here.

I would suggest that the leap is from the incremental, computational (Newtonian), left hemisphere-compliant universe to an intuitive, non-incremental, non-computational (Planckian), right hemisphere-adapted universe. Discoveries in mathematics and physics often require a leap of the imagination, the so-called ‘aha’ moment of insight, which as we have seen is accompanied by activations in the right amygdala and right superior temporal sulcus.

Cantorian proofs can be constructed to show that two lines of any length – for example, an infinitely long line and one that was one millionth of an inch long – would both have the same number of points and that a line a millionth of an inch long has the same number of points as there are in the entire universe.³⁶ Nor is an infinity going to contain everything, just because it is infinite: the series of all whole numbers is clearly infinite, but so is the series of even numbers, which doesn’t contain the (infinite)

number of odd numbers that are in the series of whole numbers. Yet the series are the same size (a one-to-one correspondence between the elements of each can be demonstrated).

What this suggests is that we must not imagine infinity to be a noun and a quantity (left hemisphere fashion), and therefore a finished entity, but a process of a certain kind and therefore adverbial (right hemisphere fashion). Oddly enough, this is *not* to treat infinity differently from other mathematical symbols: all such symbols can be regarded as shorthand for processes, just as they can be regarded as things. For example, $\frac{3}{4}$ – three quarters of, let us say, a cake – seems thing-like; but it refers explicitly to the *process* of dividing three by four. Irrational numbers (called irrational because they can never be finally resolved), such as π or $\sqrt{2}$, reveal the point starkly, because the alternative to the thing-like symbol, which is a useful shorthand for mental manipulations, is to carry on a process of division that can never terminate. The process is never-ending, but the thing is finished. We therefore need the symbol for practical purposes. As Hermann Weyl remarked: ‘*mathematics is the science of the infinite*, its goal the symbolic comprehension of the infinite with human, that is, finite means.’³⁷

Quantum mechanics poses paradoxes of its own. Surprisingly, Quine accepted that the ‘problem’ with quantum mechanics might rather be a problem with conventional Western logic. ‘Revision’, he wrote

even of the logical law of the excluded middle has been proposed as a means of simplifying quantum mechanics; and what difference is there in principle between such a shift and the shift whereby Kepler superseded Ptolemy, or Einstein Newton, or Darwin Aristotle?³⁸

Take the Einstein-Podolsky-Rosen paradox. This asserts that it follows from the principles of quantum mechanics, which provide the most complete and most accurate account of the nature of physical reality, that two quantities may instantaneously (with no temporal delay) influence each other, and without there being any contact between them. Einstein was so appalled by this that he spent the rest of his life trying to show that quantum mechanics was incomplete – without success. Because, if it is true, the cosmos is not composed of entities that exist in their own right, influencing

one another, but of patterns that are reflected in reciprocal movements of what only come to look like entities when they are observed by us. Louis de Broglie, the founder of quantum wave mechanics, wrote:

In physics, as in every other branch of knowledge, the problem of continuity and discontinuity has existed at all times: for in this science, as elsewhere, the human mind has always manifested two tendencies at once antagonistic and complementary. On the one hand, there is the tendency which tries to reduce the complexity of phenomena to the existence of simple elements indivisible, and capable of being counted; a tendency whose analysis of reality seeks to reduce it to a dust-cloud of individuals. On the other hand, there is a tendency based on our intuitive notion of time and space, which observes the universal interaction of things and regards every attempt to disengage definite individual entities from the flux of natural phenomena as artificial ...³⁹

De Broglie, like Bergson, could have had no knowledge of hemisphere difference, but seems to have intuited it perfectly from his knowledge of physics: how physical reality appears to the mind.

It is time to make the leap from reason to intuition.

INTUITION, IMAGINATION &
TRUTH

INTUITION'S CLAIMS ON TRUTH

The heart's unrest is not to be stilled by logic.

—*Friedrich Waismann*¹

If you have intuitions at all, they come from a deeper level of your nature than the loquacious level which rationalism inhabits.

—*William James*²

There is in us something wiser than our head.

—*Arthur Schopenhauer*³

IN THIS PART II OF THE BOOK WE ARE CONCERNED WITH THE PATHS BY which we may approach the truth. Contemporary culture favours science and (very much in theory) reason as the ultimately valid approaches, and is deeply sceptical about intuition and imagination – the former because it is regarded as primitive, quirky and unreliable, and the latter because it supposedly just ‘makes things up’. I suggest that this is profoundly mistaken. In Chapter 19, I will explore how intuition, in the form of producing insights, acts with imagination to establish our sense of the world and of what we can truly say about it. But first, I want to look at the role of intuition in everyday life – in how we manage the business of living.

Such intuition has had a bit of a bad press lately. Academic psychologists and philosophers are inordinately fond of thinking up experimental situations in which we are deceived by what our ‘intuitions’ tell us. These are a sort of cognitive counterpart to intriguing optical illusions: in this figure, for example, we (think we) *know* square A and B can’t possibly be the same shade and colour – and yet, I promise you, they are.

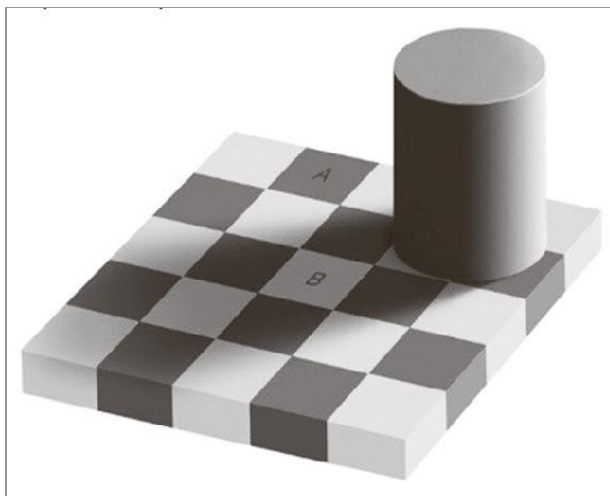


Fig. 34. Chequerboard illusion (created by EH Adelson)

Don’t believe me? Take a look at Plates 16 [a] and [b].

However, I never heard of anyone saying, after being shown a good optical illusion, ‘that does it: from now on I’m going to live my life with my eyes closed’ – whereas a lot of people seem to have come to the conclusion that intuitions are the sort of thing bright people should avoid having.

Our intuitive capabilities are often misrepresented: they are, as I shall show, less erroneous than one might assume.⁴ For instance, impressions of other people are often surprisingly accurate even when formed on the basis of very brief exposures, through ‘very subtle, almost imperceptible, nonverbal cues ... so subtle that they are neither encoded nor decoded at an intentional, conscious level of awareness.’⁵ We are fairly accurate at identifying emotions from non-verbal behaviour that we have glimpsed for only about 300 milliseconds.⁶ Often, as we will see, people make better judgments by intuition than they do by conscious deliberation.⁷ Gut

feelings are surprisingly reliable;⁸ and inferences drawn from gut feelings are not blind, but amenable to modification in the light of subsequent experience or reasoning.⁹

What is more, intuition is not just a sort of quick, but ‘rough and ready’, *faute de mieux* way of arriving at a decision that would be far better done explicitly over a longer period. It is not only faster but much more capable of dealing with more, and more complex, information. ‘For all nontrivial problems’, writes the jurist Christoph Engel,

calculating the best response is cognitively way too taxing. This, however, is true only for the consciously controlled handling of information. The automatic system handles huge amounts of information in almost no time. Only the end result is propelled back to consciousness as an intuition. Consequently, in appropriate contexts, institutions should in principle see to it that decision-makers trust their intuitions.¹⁰

Which is not to say that there are not times when the admixture of conscious deliberation pays off – why else would we have developed the capacity to add it? Just that its relationship with intuition has often, and increasingly, been wrongly conceived and projected. And we have come to mistrust, indeed allowed ourselves to become anxious about, a capacity for understanding the world which we should be celebrating.

LET'S GO TO THE RACES

A couple of years ago, a French race horse trainer, Franck Mourier, got in touch with me after reading *The Master and his Emissary*. He was 47, and had a master's degree in physiology. From childhood he had had a passion for horses. As a young man at university he researched and established a complex mathematical model for selecting the best thoroughbreds based on the correlation of around a hundred parameters. He saw himself as very methodical and analytical. All his life he had been involved in buying, selling and training racehorses.

Now retired, he lived in England, and made a living by going to the races every day and acting as a tipster. His job was to watch the runners for a few minutes before a race, and estimate each horse's chances of winning. He then produced what is called a tissue (a sheet of paper showing the 'form' of the horses competing in a race). He had done more than 1,200 such tissues over the previous year and kept records and an analysis of all the data. 'Surprisingly', he commented, 'my percentage has been consistently better and more accurate than the market consensus.' But he and his colleagues soon began to notice 'some strange facts that should upset any rational mind'.

Two minutes before the race started, he would communicate the tissue to his partners, who then exploited any difference between his opinion and the market. When he rang to give his predictions, there would typically be a conversation such as this:

Franck (reading from the tissue): Love Dreams ... 50% ... But I don't believe he can win!

Team: Ok, but why did you put 50% chance to win, then?

Franck: I really don't know!

Team: What should we do then?

Franck: I don't know!

Team: The race begins in one minute, the market on Love Dreams is 20%. What do you want us to do?!

Franck: I don't know, change Love Dreams to 20% ...

‘As you can imagine’, he told me, ‘Love Dreams then wins,’

and the team are upset because they weren’t able to take advantage of my tissue. Such examples went on and on, until the day when the team said, ‘Don’t call us anymore. Just text us your tissue and don’t comment on it!’ This produced better results, of course, but the fact that I have to keep my mouth shut really torments me.

He had also noticed that the more pressure he felt under to come up with a good tissue, the worse he would do:

Previous life experience taught me that the more preparation you make, the more commitment you have and the more you focus on a goal, the more likely you are to achieve it. Strangely, after analysis of the 1,200 tissues, it appears that the opposite is true. And if I write one bad tissue (one in which I do worse than the market), I am three times more likely than chance to write another bad one in the following race ... I can’t help it; again, the harder I try, the worse the results.

He found that he was getting a little better at dealing with it, but was still handicapped by emotions such as self-blame, fear of losing, and aversion to risk that got in the way of ‘simply trusting what I see’.

A year passed, and he wrote to say that he had made ‘significant progress’. He had come to realise that the problem was that he just could not believe his own success:

How can I pretend to know that horse A is going to run a mile one-tenth of a second faster than horse B, just by looking at them for a couple of minutes before they run? It doesn’t make any sense to me, but somehow it consistently works! The margins between winners and losers are always terribly slim. So how is it that my predictions can be so accurate – consistently better than everyone else? It creates a terrible discomfort; I am still never truly secure and confident about a tissue I’ve just written.

On his suggestion, his wife Capucine ('Capy') also wrote to me to explain what she had observed. At first, in his new role as tipster, Franck had seemed rather odd, insecure and ill at ease. She could not understand why it was that, although he could see how good his predictions were, he refused to go ahead and process any tissues. In an effort to help understand, Franck had started reading various books, including *The Master and his Emissary*. A few days after starting reading it, he apparently told her: 'Iain is talking about exactly what I am experiencing, in the way he describes the brain hemispheres'. He was amazed by the sense of having discovered 'a new part of the brain he was not aware of using before, and as a scientist and left-brain user he did not want to accept it or believe it ... and yet he was really moved by what he had learnt.'

Capy, also a horse trainer, with a background in law and economics, then also read the book and felt a similar realisation. As a result of this, at least as she and her husband put it to me, a number of things changed. 'We needed to find ways to help Franck shut off the constant presence of "the left brain". He started being more open, talking about his emotions (something new!); he became more sensitive to the things around him, and became more creative.' As a result, Franck's role in the family had changed, and, along with it, their relationship, in a whole range of ways – much (as they both confirmed) for the better.

He had been 'tipping' races between five and 10 times a day for more than two years, and now had a rich database of more than 3,000 tissues, which were analysed by the team so as to monitor his performance. He was proud to report that his success meant that he made considerably more than a comfortable living.

I asked him to describe what he actually did. He explained that a meeting consists in a succession of six to eight races with 30 minutes between each of them. Before each race, the horses are led into the paddock, and walk for a few minutes around it; five minutes before the race, the horses will gallop to the start. He, like the rest of the crowd, would observe them, with or without binoculars. He would then write a tissue, which would usually take about 20 seconds, in which he would accord each horse a percentage chance of winning, and then send a text to his team. 'I do not fully understand why I am writing these percentages in front of each horse', he told me, 'and, surprisingly, the less I understand it the better it is. I never go to the races with too much previous knowledge and information.'

When I have a tissue already in my head before I see the horses it usually results in disaster.'

Conscious that experts can rarely articulate how they are able to do what they do, I nonetheless asked if there was anything he was aware of looking out for. He replied:

I am really at a loss to explain what I am seeing, and have generally no real clue how I come to a percentage. It is definitely a combination of a lot of factors – but if I had to name a few, they might be: Does the horse look happy or worried to be on the racetrack? What is the quality of the relationship between the horse and the person that leads him to the race? Does the horse appear healthy and fit? Are jockey and horse a good match? Does the horse trust his jockey and listen to him? Can the jockey understand the horse and communicate with him properly? But again these are just some impressions. It is not consistent and certainly not straightforward ... Anyway, after the race we can immediately see the accuracy of my predictions. Then the process starts again in the next race.

It seemed to me that Franck could have a second career as a psychiatrist, were he in need of one, which he clearly wasn't. But how, I wondered, had he come to realise that these intangible feelings about relationships were more important than any measurable facts about the horse? He couldn't say.

By close scrutiny of his record, he and his wife had worked out that there were a number of factors that made a significant difference to his performance. For example, his 13 year-old son loved to come to the races with him, and Franck really enjoyed his company. He was supportive, very knowledgeable about horses, and understood what his father's job entailed. But a comparative analysis of the 100 tissues written when with his son and 100 from the same period when he was on his own showed that with his son he averaged £0 per tissue, while without him he averaged £1,000 pounds per tissue. 'This asymmetry could not be explained by chance alone', Franck remarked, 'so the team asked him kindly to stay at home'.

He needed also to dissociate himself from 'anything material or financial' during the mornings before the race, and to remain ignorant of the

amounts at stake, or it would ruin his form: ‘The best results are achieved when I see it as just a game with no pressure ... as if I am going to the races just to enjoy the horses and write the percentages I feel.’

He also reported that he used to wake up very early most of his adult life and could get away with very little sleep. Now he and his wife had noticed that he needed a long sleep, ‘and I do even better if I have a little nap in the car, right before the races start’.¹¹ The significance of this will be touched on later.

This story, it seems to me, describes perfectly the plight of an intuitively gifted person in a society resolutely hostile to intuition. So bad have things become that we have difficulty accepting indisputable facts because our theory contradicts them. Unusually, this was a situation in which intuitions could be tested against incontrovertible and immediate evidence, time and time over – and yet so deep is the mistrust with which we have been indoctrinated, that Franck initially became miserable, withdrawn and immobilised by anxiety, rather than accept the reality of his gifts. Of course, the idea that my book made much of a difference I put down to the generosity of the account I was given; it may, though, have provided Franck with an insight into a scientific basis for accepting his own intuitive faculties.

‘While the American army was being menaced by hidden improvised explosive devices’, writes Peter Struck, in a recent scholarly examination of the history of divination in the ancient world,

certain soldiers appeared to their comrades to have preternatural abilities to sense the presence of these bombs. The army, in a deeply pragmatic spirit, poured money into studies of such people, trying to see whether there was anything to the anecdotes. Cognitive scientists determined, in a finding not at all surprising to those familiar with the discipline, that some soldiers indeed had more accurate predispositions to sense trouble than others. When the soldiers were asked to describe how they knew something was out of order, they called it a hunch, or a gut feeling ... It is, of course, more than just uncanny that two millennia ago the single arena in which the seer’s gifts were most consistently valued was also the battle field. According to the Greek military handbook by the 1st-century CE tactician Onasander, a general should be temperate, self-

restrained, vigilant, and hardened to labour – and he should also be a skilled reader of entrails, so he can be personally involved in the readings his diviners are giving him ...¹²

Perhaps there was an intuitive metaphorical connexion between experiencing gut feelings and inspecting entrails. But there is more to it than that.

Speaking of ‘gut feelings’ may, like our references to the heart in matters of deep emotion, be more literally correct than we have become accustomed to think. Both feelings of anger and a ‘broken heart’ can trigger a heart attack.¹³ A meta-analysis shows that it is the right hemisphere that predominates in receiving and interpreting information from the heart.¹⁴

The gut and the psyche have close connexions. Anxiety, depression, and other disorders have characteristic expressions in gut behaviour – and the associations work both ways: diseases of the gut affect mind and mood. As well as containing 95% of the body’s serotonin, which also acts, as is well known, as a neurotransmitter in the brain, and is thought to be involved in affect regulation, the gut has some 200–600 million neurones, rather more than there are in the brain of a dog.¹⁵ And most of the neural traffic is from the *gut to the brain*, not the other way round. You can take it that they are not all just there to control peristalsis: ‘The system is way too complicated to have evolved only to make sure things move out of your colon.’¹⁶

Struck gives an account of the famous Pythia, the High Priestess of the Temple of Apollo at Delphi, to whom ‘people that had run up against the limits of their own knowledge brought their remaining questions’. He emphasises not just her female sex, which the Greeks associated with ‘body over mind’, but her ‘legendary illiteracy’; and that for them what was felt to be divine in nature was deeply rooted in the corporeal, in what we share with animals, bypassing the everyday realm of the explicit on the way.¹⁷ When she spoke, her utterances were famously oblique, and came in the form of poetry. ‘When that realm which lay above us chose to speak’, he writes, ‘the messages mostly came in and through the one that lay below us. It does not simply stand to reason that the phenomenon would be organized this way.’

In most non-Western cultures, people describe a faculty or faculties, corresponding to intuition or a sixth sense, whereby they can discern

matters absolutely not present to consciousness. We should be careful to attend to this and not dismiss it as ‘superstition’.

INSTINCTS

Many of the patterns that organise and make sense of the dance of life in animals – and importantly in humans – come from somewhere, we have little or no idea where or how: instincts. Instincts are usually taken to mean deeply embedded drives that do not have to be learnt, are not pursued as conscious aims, and find their fulfilment directly in their expression. Examples might be the instinct to eat when hungry, and probably the choice of *what* to eat (eagles don't waste time on strawberries); to drink when thirsty; for a predator, to hunt; for prey, to look out for predators (hens that have been brought up from chicks in barns immediately show fear reactions when exposed to predators they have never before encountered); for a bird to fly (birds brought up without the opportunity to observe or be guided by adult birds nonetheless fly when released from confinement);¹⁸ in migrant animals, to migrate; to make a home – a den or a nest of some kind; to seek a mate, to take part in ritual displays and to procreate; to protect one's mate, one's young and one's territory. There are others that are more highly evolved: to form relationships;¹⁹ in apes and humans, and probably other taxa as well, to imitate members of one's own species (human infants will in some cases copy an adult's facial gesture as little as 45 minutes following birth);²⁰ to utter in order to communicate (in many species), to sing or call (in birds), arguably to develop language (in humans); both to compete with, and, in mammals at least, to empathise, and co-operate with, other creatures.

But there are many, many others. William James indeed held that humans, rather than having somehow 'cast off' their instinctual nature, having fewer instincts than animals, had many more: 'man possesses all the impulses that they have, and a great many more besides. In other words, there is no material antagonism between instinct and reason ... no other mammal, not even the monkey, shows so large an array.'²¹ If imitated patterns of behaviour become hardwired – and they do – and we are the imitative species, *par excellence* –and we are – this makes perfect sense. James's colleague CS Peirce, who thought that we were born not just with the basic biological inclinations, but 'certain tendencies to think truly about physics, on the one hand, and about psychics, on the other', wrote: 'if you

are going to think every poor chicken endowed with an innate tendency toward a positive truth, why should you think that to man alone this gift is denied?' ²²

As far as the chronology is concerned, instinctual drives are always 'on' in the background of our lives. At times they can be accentuated for obvious reasons, and at times they can be overridden, though James thought they could be overridden only by a contrary instinct, and that cognition in and of itself had no power to gainsay an instinct, having a role, rather, in leading one towards a position where a counter-instinct could be reinforced. Instincts can also wither, if the environment affords no opportunity for them to be established – or if systematically disattended to, as in our society today.

Here I should mention an interesting recent development. The idea of human instincts about physics and 'psychics' that Peirce alludes to, and that James suggests are so numerous, is a way of accounting for shared forms of thought and feeling, of apprehension of the world, of knowledge and understanding even, that appear to be in us without ever having to be learnt – something reminiscent of Jung's idea of the collective unconscious. We now have suggestive evidence of possible mechanisms of transmitting one generation's experience to the next. For example, it seems that trauma suffered by Holocaust survivors may have been passed on to their children.²³ A genetic study of 32 Jewish men and women who had been interned in a Nazi concentration camp, or witnessed or experienced torture, or who had had to hide during the Second World War, showed that they and their children exhibited epigenetic changes not found in children of Jewish families who were outside Europe during the War. The changes were in the region of a gene that is known to be involved in regulating stress; the children also had an increased likelihood of stress disorders.

This builds on research in animals, showing that induced fears in one generation may be inherited by the next. Mice were trained to fear the scent of cherry blossom by coupling it with a small electric shock, so that eventually the mice showed a fear reaction when exposed to the scent on its own. The offspring of these mice, despite never having encountered the smell of cherry blossom before, or having any reason to associate it with anything unpleasant, had the same fearful response to the smell on first exposure – and so did their own offspring. Epigenetic changes at the site of a gene responsible for detecting this scent were found.²⁴

The implications of this are important, and incidentally form an example of how scientific intuition can eventually win out against dogma. It used to be doctrine that acquired characteristics could not be transferred to the next generation: Lamarck, who was intuitively right, was held to be plain wrong. With the discovery of the importance of epigenetics that has changed. Perhaps Lamarck was not so wrong after all. Many beliefs that were once intuitions only have been found to have a basis in science, and I have no doubt that many more will in the future, as the horizons of science inevitably expand.

One of the great questions in this continually evolving universe is how it is that we come to express, without being taught, patterns of behaviour, patterns of thought, that we share with our ancestors, and why do we not have to wade through all the options laboriously in order to rediscover them. Enculturation is an obvious response, and one that is surely correct up to a point; but it doesn't by a long way cover all the observable phenomena, including the inheritance of tastes, physical gestures, mannerisms, predilections, of people to whom we are physically related but whom we have never met – and even possibly by transplant of an organ, such as the heart, though that is still controversial at this stage.²⁵ As a grandparent I have seen physical mannerisms, facial expressions, and tastes unmistakably expressed in my children and grandchildren that are identical to those in forebears they never knew.

Rupert Sheldrake's idea of morphic resonance seems to me a concept very well worth considering seriously, though in the current climate in science it is generally anathema.²⁶ According to Sheldrake, morphic resonance is

a process whereby self-organising systems inherit a memory from previous similar systems. In its most general formulation, morphic resonance means that the so-called laws of nature are more like habits ... Thus each individual inherits a collective memory from past members of the species, and also contributes to the collective memory, affecting other members of the species in the future.²⁷

The question, of course, is: how? It is often objected that this would be to endorse the existence of forms that can be detected only by their

consequences. As David Bohm rightly stressed (*à propos* another matter, though he was certainly not dismissive of morphic resonance):

There is no reason why an extra-physical general principle is necessarily to be avoided, since such principles could conceivably serve as useful working hypotheses. For the history of scientific research is full of examples in which it was very fruitful indeed to assume that certain objects or elements might be real, long before any procedures were known which would permit them to be observed directly.²⁸

In fact, being at least open to the hypothesis is necessary in order even *to make the observations* that could validate the hypothesis.

Epigenetic changes may be a special case of such morphogenetic fields in operation (after all, like all fields known to physics, they would have to interact with material mechanisms in some way). Recently, the frequency of oscillation of electromagnetic fields has been found to make the difference between carcinogenic and cancer-inhibiting effects on organisms, and this is not a one-off finding, but consistent with a large and rapidly growing body of evidence – the mechanism is, however, uncertain.²⁹ Yet a tumour can be seen as, in some practical sense, an independent organism with its own primitive morphogenetic field;³⁰ an ‘opportunistic, self-organizing, and adaptive complex dynamic biosystem.’³¹ Whether it realises itself or not seems to depend on the resonances within a field.

Instincts are, indeed, much more remarkable than we often assume. How do complex patterns of behaviour become present to offspring that may not have known their parents – for example, the complex mating routines of hummingbirds and birds of paradise, or the octopus’s building of a garden out of attractive shells? Not to mention a bird ‘simply’ flying, or building a nest of a certain kind in a certain way in a certain sort of place, or, in the case of a cuckoo, invariably *not* building a nest, but flying thousands of miles in order to commandeer some luckless other bird’s nest? Or a spider weaving its web? How is it that repeated patterns of behaviour create changes that allow such complex four-dimensional behavioural patterns to be transmitted from generation to generation? Where exactly are these patterns instantiated?

Are archetypes something similar to this? Jung suggested that instincts and archetypes were related as, respectively, motor and sensory phenomena with common ancestry: ‘instincts are typical modes of action’, while ‘archetypes are typical modes of apprehension’.³² An archetype is not like a stereotype. Unlike the stereotype, which is a *post factum* abstraction that is purely general in nature, the archetype exists *ante factum*, and is instantiated. It is the coming together of the absolutely unique with the absolutely universal – in fact this absolutely unique experience is felt as both absolutely unique and absolutely universal at the same time. Every time someone falls in love, the experience seems unique, as though it could never have happened before or ever happen again in the history of the world. And yet it is as ancient as humanity itself – or older – as the experiencer also acknowledges. It is both a typical human experience, and a completely unique one, of unmatched power and significance. And so it is, to one extent or another, with all archetypes. In fact their constantly repeated nature is part of their power: according to Jung, ‘endless repetition has engraved these experiences into our psychic constitution.’³³ When we encounter them afresh, it is the experience, not of cognition, but of recognition, or anamnesis. The finding of the universal in and through the unique, rather than by turning away from it, is a theme I will recur to.

Jung was influenced by both anthropology and the study of the evolution of animal behaviour patterns. From these arose his idea of the archetype as a structuring principle, which he found reflected in the history of both philosophy and mythology.³⁴ We can observe motor instincts more easily than we can observe the reality of the archetype within consciousness. Since we know, however, that perception and sensory function are tied to motor function, each depending for its coherence on the other, it seems probable that archetypes will exist as the imaginative counterparts to instinct. Jung argues that instinct and archetype ‘determine one another’,³⁵ and he suggests that the archetypal may be experienced as an affective state through an image, metaphor or myth.³⁶

Jung thought of archetypes as paths that our ancestors had traced, or rivers they had followed, and that every time an experience of this powerful nature was recovered it opened up an ancient riverbed:³⁷

Archetypes are like riverbeds which dry up when the water deserts them, but which it can find again at any time. An archetype is like an old watercourse along which the water of life has flowed for centuries, digging a deep channel for itself. The longer it has flowed in this channel the more likely it is that sooner or later the water will return to its old bed.³⁸

We are transmitters, as D.H. Lawrence said. It may be that much of our thinking and behaviour is relayed to, and through, us: not originated by us at all.

Instincts are not the same as intuitions, since they seem to be general and inherited, though forms of behaviour and thinking we might not generally call instinctual may be inherited too, as the findings of evolutionary psychology suggest, and so the difference cannot be absolute. Intuitions may have taken a long time in evolving, both through individual experience *and* through that of a whole historical culture. As anthropologist Merlin Donald puts it,

individual decisions are made in the brain. Human brains, however, are closely interconnected with, and embedded in, the distributed networks of culture from infancy ... Humans are collective thinkers, who rarely solve problems without input from the distributed cognitive systems of culture.³⁹

As far as the significance of the hemispheres goes, most of these drives are dependent on subcortical regions, some as deep as the brainstem, and certainly the limbic system. Such global drives cannot be ascribed to one hemisphere alone.

THE BALEFUL EFFECTS OF CONSCIOUSNESS

On the Isle of Man, off the west coast of Britain, there is an annual event called the TT races. This is a terrifying motorcycling event quite unlike normal circuit events, since it takes place on ordinary public highways, and has been described as the most dangerous sporting event in the world. By an act of the island's independent parliament, the Tynwald, the island's roads are closed to ordinary road users for two weeks. A medical consultant who looks after the well-being of the contestants wrote to me with some intriguing observations. He began by explaining the origin of his interest in the competitors:

Why TT racers, not circuit racing? There are significant differences: circuits are smooth, little high speed, many corners, and a grid start. Riders are focused on each other and corners are tactically vital, so position and braking are key. The TT, by contrast, is a time trial, so no grid start, riders go off individually and race their own time, so to speak. A map of the course suggests many corners, but the fast ones say there are only three, the rest are fast sweeps. Fast is the key here, as sustained speeds are now up to 200mph, which is nowhere sustained on any British circuit. Finally it is a normal island road, which is not smooth, not swept, and with drain covers, patch repairs, etc. It is nearly 40 miles long and climbs from sea level over the mountain; the weather is different around the course and the mountain can be fairly gusty. The key is great *smooth riding* – there is no late braking or diving under; and good TT racers don't generally do well on circuits. It is a specialised and dangerous game: there are no run off areas, just stone walls, which it is normal to brush the leathers against at speed.

So clearly there is little room for error: what those who are successful can tell us will be of considerable interest. What do they report?

An example: the speed past the grandstand is around 175mph, yet just past is a blind brow covering a fierce drop down Bray Hill,

which has a kink at the bottom. I suggested to a good racer that surely you have to be inch-perfect at the grandstand, as you do not have time to correct your line before the plunge down Bray Hill and the kink at the bottom. He replied that when you go past the grandstand you're thinking of the Quarterbridge. Now the Quarterbridge is a mile further down the track ... It begs the question as to exactly what the present moment means to these chaps.

Conscious will is a handicap. The doctor described two riders battling

the whole way with very close times. They started together and stayed together for the whole race until the last lap when [X] missed a gear coming out of Ramsey, saw his fellow disappear in the distance, and with only the climb up the mountain to go knew he had lost. Happy to come second, he 'backed off', as he said, but to his amazement caught the lad up fairly soon, and overtook and won. It is possible that, by abandoning the determination to win following the missed gear, he removed a small bit that was interfering with his actual capability ... A similar tale involves the truly great [Y] who, following a pitstop fumble, had lost too much time to win, so accepting second place as a given, backed off to run a risk-free last lap. He broke the lap record, a very difficult thing to do, requiring absolute perfection, and did not believe it when told, as he thought he was little more than touring home.

Further observations were:

- all anxiety goes when they start, almost like a switch; some say their body vanishes (ie, they are so in their body that they don't notice it as distinct from the self);
- they operate in a weird state where they say they are 'way ahead of the bike': pictures that show their eyes at difficult parts of the course would make you think they are quite unfocused, gazing at infinity;

- perception is quite markedly improved, which may be visual, but is also auditory and tactile, and ‘they are quite happy to include a sixth sense’; one rider describes entering a ‘horrendous fast descent to a tricky left hander and noticing a spectator stood back in a field light a cigarette, saw the puff of smoke blown by the wind, and smelt the tobacco inside his full face helmet’;
- they say they have all the time in the world, in fact time slow-down is almost universal, particularly in accidents, where they are able to think and act in slowed down time.

My correspondent had another fascinating observation. Racing engines get extremely hot and ‘operate very close to piston seizure’, so the temperature gauge is vital. One rider had fitted a new digital gauge: his performance deteriorated drastically and he only regained form after re-fitting the old analogue one. The digital gauge presented him with changing numbers, whereas the analogue presented a sweeping scale. Having to ‘read’ the digits, rather than see the position of the needle, interfered with his smooth racing. And the number would flicker and change, over a degree or two of no consequence, all the time: the sweep gauge supplied the trend without distraction. My correspondent wondered if some accidents were due to the left hemisphere taking hold.

The ideal state described is one in which attention must be far from the immediate point in space and time, instead inhabiting the whole feel or shape of the course as it unfolds; the passing of time and the presence of the body are not noticed – not because they have gone away, but precisely because they are so completely inhabited that they are no longer available for inspection, no longer ‘objects’ to which focussed attention could be drawn. They are no longer *in* the field, they *are* the field. All is *zuhanden*, nothing *vorhanden*. This enables ‘smooth-riding’: being in the flow. All anxiety, which narrows attention, all analytical thinking or interpretation, all distracting, obtrusive detail, must be banished. It is not unlike some aspects of both a trance-like meditative state and the mental state described by practitioners of Japanese martial arts.

Experiments with experienced handball players indicate that they make better decisions when they have less time.⁴⁰ Expert golfers (though *not* novices) do better when they have only three seconds to putt than when they can take all the time they want.⁴¹ Analytical decision-making seems to

interrupt the intuitive processes that serve experts well. This is not confined to non-cognitive tasks. Instructing individuals to verbalise their reasoning disrupts otherwise effective processes that are outwith the realm of language, leads to over-focus on elements of the superficial structure of the problem at the expense of the depth, and can lead to poor decisions.⁴² This is the phenomenon known as ‘verbal overshadowing of insight’.⁴³

As Peter Struck’s comments on the Delphian Pythia suggest, it seems that we make our best judgments about risk outside the petrifying stare of consciousness. Unconscious influences lead us to the right answer, and in their absence conscious strategies do not suffice – indeed, they can impede. We often revise better decisions taken more intuitively and replace them with worse decisions after thinking them through more explicitly.⁴⁴ Experiments have indicated that conscious deliberation (explicitly verbalising and analysing reasons when making decisions) can have a disruptive effect.⁴⁵ As a corollary, being prevented from deliberating is not always detrimental to, and can improve, decision-making.⁴⁶

In a famous and often repeated lab test called the Iowa Gambling Task, subjects are asked to turn over cards from four packs, two red and two blue. Depending on the card, they will either win or lose money, and their goal is to maximise winnings. Effectively the red cards are disastrous – you can win well, but you can also make heavy losses; and the best strategy is to stick to the blue cards which give you regular, modest winnings. Although it takes subjects usually about 80 cards to be able to articulate what is going on, they are able to verbalise a preference for the blue cards after about 50. However, in one study, the subjects were hitched up to a polygraph (a ‘lie-detector’), that measured how sweaty their palms were. What this revealed, astonishingly, was that after only 10 cards, long before the subjects were conscious that there was a difference, the polygraph registered that they were more anxious when their hands hovered over the red cards: and that already at this point, though again the subjects were not aware of it, they had *actually started to change their behaviour* to accommodate the new information. Long before the conscious mind reached its conclusions the body had perceived what was happening and was already responding to it.⁴⁷ It should not surprise us to learn that lack of awareness of emotions negatively affects intuitive decision-making.⁴⁸

When asked for their judgments about which decks rated good or bad, subjects often responded in a manner discrepant with the actual choices they made on the task. Unconsciously they were aware of what their articulate left hemisphere was not. It seems that, when information conflicts, we tend to favour implicit over explicit knowledge; until we are asked to reflect on the matter consciously, verbally – with the reverse outcome.⁴⁹

Not everyone's 'gut feelings' are helpful, however, and for some individuals they lead to consistently wrong choices. Whether this is because such people are trying too hard, and the conscious effort is getting in the way, is not known. But one possibility may be that those more alert to their own autonomic responses, such as their heart beat, are those who make the best players. When subjects were tested for their ability to monitor their own heart beat prior to the gambling task, it turned out that those who were better able to do so – literally to listen to what their heart was telling them – were better at the game.⁵⁰

This was interestingly reflected in a study carried out by Stuart Valins in the late 1970s. It had been previously reported that an increased heart rate was related to higher levels of accuracy in interpreting facial gestures,⁵¹ and that heart rate was one cue that some participants were aware of using to gauge appropriate responses when asked to respond to visual stimuli.⁵² A group of people were filmed while concentrating on a gambling task. When other subjects were asked to interpret, from the facial expressions on film, how much money someone had just won or lost, the subjects were separated into so-called 'intuitives' (those who responded almost immediately, but could not verbalise about their process) and 'intellectuals' (those who delayed responses until the latter half of each trial session, but *could* verbalise about their process). Each subject did the test four times, in two blocks of two. On one occasion in each block they were given reinforcement, in the form of monetary reward, if they got a right answer. On the other they were not. And then the order was varied, so that they did both conditions again, but in reverse order, in order to rule out an effect of precedence.

What the experimenters discovered was on the surface puzzling. Overall, there was no difference between the two groups in terms of efficiency. However, under reinforcement conditions, the level of accuracy for intellectuals was significantly higher than for intuitives: but under *non-*

reinforced conditions, intuitives performed significantly more accurately than intellectuals. In other words, for intuitives, the rate of accuracy actually declined significantly when they were given immediate reinforcement about correct responses.

The phenomenon of ‘choking’ refers to the well-attested fact that people often do worse on a task when the reward is higher – a familiar phenomenon in sport, but also in the workplace. Why would that be? One possibility in the Valins test is that the external reinforcement drew attention consciously to performance, made them self-conscious, and interfered with their sensitivity to the internal cues they were receiving from their body.⁵³ But there are others. A study of people playing a computer game in which they had to catch prey looked at the brain correlates. As expected those offered the higher rewards did worse. On the scans, there were changes in midbrain function (ie, at the level of the brainstem) between the two conditions, but the cortical areas which were more active in the low-reward than high-reward condition as the subjects approached their target were the right anterior cingulate and right medial prefrontal cortex.⁵⁴ If these were relatively ‘switched off’ by trying too hard for the higher rewards – remember the left hemisphere is acquisitive – that would explain why ‘intuitives’ were more handicapped than ‘intellectuals’ in the high-reward condition. Note that the conscious mind thinks it knows best, despite its lack of understanding.⁵⁵

We are often – in fact, usually – unaware of the patterns that govern our insights.⁵⁶ They operate only at the unconscious level and are often quite complex. Arthur Reber, a pioneer in the field of implicit, or unconscious, learning, showed that people can learn complicated patterns without any awareness of doing so. Simply from memorising a list of letter strings (derived from a ‘grammar’ of which they are completely ignorant), subjects can judge subsequent test strings as ‘grammatical’, or not ‘grammatical’, even though they have no conscious sense of why, eg:

'Grammatical' strings	'Non-grammatical' strings
VXJJ	VXTJJ
XXVT	XVTWJ
VJTVXJ	VJT TVTV
VJTVTV	VJTXXVJ
XXXXVX	XXXVTJJ

Moreover, knowing beforehand that the letter strings to be memorised have come from an underlying grammar *decreases* the subjects' performance, presumably because it alerts the left hemisphere to look for rules it is not going to be able to articulate.⁵⁷ Several studies have shown that the ability to learn at an implicit level is impaired by asking subjects to look actively for complex patterns, an effect that has been called the 'benefit of not trying'.⁵⁸ As one team put it, 'learning predictive relations between events depends on *attention*, not on awareness'. That sounds rather like the way that many skills are learnt: by a habit of receptive *attending*, that is more important than awareness – and might actually be inhibited by awareness; though in the earlier stages explicit rules can help up to a point.⁵⁹ This ability to detect a pattern in the absence of verbal awareness is *prima facie* likely to be mediated by the right hemisphere, a hypothesis that is confirmed by superiority of the left hand over the right when asked to respond in such circumstances.⁶⁰

It might seem obvious that you take things in better when you are focussed on them; and that you will make better decisions if you are thinking about the question that needs to be decided. But neither of these is necessarily the case: in fact often the opposite applies, as repeated psychological studies have suggested.

In one study subjects were asked to look at a series of abstract images. During half the task they were able to concentrate, but during the other half they were deliberately distracted. When they were later asked to identify images they had seen, they did better on the pictures they had viewed while distracted.⁶¹ When, in another study, subjects were asked to detect the odd one out in a field of symbols, responses were more accurate when time was severely limited (to less than half a second).⁶²

Furthermore, in a test of originality, subjects were asked to generate items in response to a cue. There were three conditions: in one, they had to respond immediately; in the second, after a few minutes' conscious thought; and in the third, after being distracted for a few minutes on another task. The most creative and original answers came from the group that had been distracted.⁶³

Using a geometric and spatial insight problem, it was found that providing participants with breaks improved their performance as compared to participants who did not receive a break. However, the length of incubation between problems did not matter. Thus, participants' performance on insight problems improved just as much with a short break (four minutes) as it did with a long break (12 minutes), suggesting that disruption of conscious deliberation was enough to improve performance, irrespective of the *length* of disruption.⁶⁴

In another study, this time of decision-making, subjects were asked to evaluate the best out of four models of car on the basis of 12 criteria.⁶⁵ One group were given time to ponder before coming to a decision; the other had to move on immediately to address another task after reading the information through, and then made a spontaneous decision later. The first, 'pondering', group chose the best car only a quarter of the time, whereas about 60% of the 'spontaneous' group made the right choice. Some other studies suggest that subjects make better decisions immediately after reading all the characteristics than after *either* a short period of conscious consideration *or* a short period of distraction, suggesting that it's more that their first thoughts are best than that there is a period of unconscious 'mulling'.⁶⁶ But overall it would seem that a (brief) period of 'mulling' does improve judgments.⁶⁷

Interestingly, the advantage conferred by distraction seems only to work when the participants are induced into an appropriately holistic way of thinking (they are asked to form a global impression of each alternative) not when they are encouraged to adopt a 'featural' one (in which they are asked to compare individual attributes of the alternatives).⁶⁸ For example, participants who are simultaneously engaged in a distracting task are able to differentiate good from poor shares on the basis of 75–150 numerical return values that were presented at a fast speed – but *only* when the participants were asked which shares 'feel better', rather than, for example, to report

which of the shares had the highest average, which encourages focal attention.⁶⁹

The ‘conscious’ and ‘unconscious’ are not wholly distinct realms. The whole discussion of ‘conscious’ and ‘unconscious’ processes is set up as though the two were different species of fish kept in separate tanks. As I have argued elsewhere, the boundaries of consciousness are fluid, and elements can come and go from conscious awareness from millisecond to millisecond, rather as objects ‘appear’ and ‘disappear’ when a spotlight moves around a stage. And the field of consciousness at any moment in time has no sharp edges, but a ‘fringe’ around it where it meets the unconscious. This area on the edge of awareness is far more fruitfully creative than the centre of the field of consciousness. The essential point is whether what we ‘see’ is paralysed by *focussed attention*, such as the left hemisphere applies, or freed up by *attention to the field as a whole*, as is the case in the right hemisphere. Arguing about consciousness versus unconsciousness misses the point. If we are able to bypass that dichotomy, there emerges a point on which both sides (proponents of conscious and unconscious ‘processing’) might be able to agree: closing down to narrow attention is what needs to be avoided, whether by depriving the serial-processing left hemisphere of time, or by distracting its Gorgon stare elsewhere.

While I am on this topic, I am often asked whether the unconscious mind can be identified with the right hemisphere. It is sometimes argued that the right hemisphere is less conscious than the left, and most neuropsychologists seem to assume that this is so: I understand what is meant.⁷⁰ To the extent that what we mean by unconscious is ‘outside the spotlight of attention’, the answer is a definite ‘yes’. But this doesn’t mean it has no awareness of the world, indeed quite the opposite. After a major left hemisphere stroke the subject has a greater awareness of the world than someone who has had an equivalent stroke in the right hemisphere – even, arguably, in some respects greater than normal.⁷¹ Any unconsciousness here is limited to a lack of *self-conscious* awareness.

The key point to remember is that what is capable of being retained in the centre of our field of awareness is very limited indeed, and when we use only what we see there to construct our view of reality we go wrong. Not just because of how little we can see there, but because even the little that we *can* see is necessarily distorted by the type of fixing, isolating,

abstracting, distancing, devitalising attention brought to bear on it. To this extent we rely heavily on the right hemisphere and what it knows – all of which, from the left hemisphere point of view, is classed as ‘unconscious’, since it knows very little about it.

It is this very large field open to the unconscious, by comparison to the conscious, that Malcolm Gladwell’s interesting account in his best-selling book *Blink* appears to me to miss. He supports the idea that intuitive expertise relies on reaching a conclusion on the basis of minimal information: but by identifying ‘thin-slicing’ – which he interprets as the sampling of very few elements in a picture – he gets hold of exactly the wrong point.⁷² What is distinctive about the unconscious mind is not how little, but precisely how much, it takes into account, very quickly. This was the point made earlier by jurist Engel of the Max Planck Institute. By contrast with the conscious mind, which cannot hold all the information at once, and therefore tends to focus only on a handful of salient details – sometimes simply the last details it heard – the unconscious mind appears capable of dealing with complex patterns that can’t easily be reduced. Gladwell’s substitute for this holistic perception is what he calls a ‘thin-slicing flurry’.⁷³ Of course, looked at from the perspective of the analytic left hemisphere, that’s what it must seem to be. Yet what is actually being represented is a brief but *continuous process*, not a small *series of slices*.

Part of the power of the unconscious mind is its capacity to deal with numerous different elements *simultaneously* – and, even more importantly, to see their interconnexions one with another. This form of parallel processing is central to pattern recognition because it is able, without obtruding into conscious awareness, to take note of complex simultaneous events, and the emergent patterns of connexion: a seamless process.

There is a tendency to think that because it is quick, it must rely on a simplifying dirty trick. Not so. Equating unconscious intelligence with the ability to reduce situations to a simple underlying pattern is at best incomplete.⁷⁴ In some types of situation it may be possible to reduce matters to simple underlying signatures, but these are unusual – those in which one or two pieces of information have a disproportionate role in the outcome. The conscious mind can maintain in an active state and process only four to seven pieces of information at the same time.⁷⁵ It is at its limit when recalling a phone number it has just heard. However, the unconscious mind does not have the same limitations. The intuitive embodied parallel

processing approach is essential: rather than being just a source of bias, it integrates across a huge range of values and judgment factors.⁷⁶ And experiments on implicit learning reveal that, as the underlying pattern gets more complicated, the unconscious mind tends to have the advantage – which does not seem to fit with what Gladwell would have predicted.⁷⁷

Gladwell makes good use of the intriguing case of the Getty *kouros*, but draws, it seems to me, the wrong conclusions. This concerns a purportedly archaic Greek sculpture of a naked young man (a *kouros*) that the Getty Museum acquired, believing on the basis of extensive documentation and a number of expert opinions that it was genuine. However, other experts, asked to examine it, found themselves extremely dubious, sometimes referring to incidental details (one refers to a detail of the fingernails), but generally appealing to a sense that it immediately – and it was in almost all cases an immediate reaction – looked wrong as a whole. One said that it felt too ‘fresh’. Another said that he felt physically sick in its presence. Eventually, after piece upon piece of paperwork attesting its ancient provenance proved to be a forgery, the case for its authenticity started to look thin.

It is notable that the famous art historian and connoisseur Bernard Berenson described his talent for validation of masterpieces as a sixth sense. ‘It is very largely a question of accumulated experience upon which your spirit sets unconsciously’, he said:

When I see a picture, in most cases, I recognize it at once as being or not being by the master it is ascribed to; the rest is merely a question of how to fish out the evidence that will make the conviction as plain to others as it is to me.

Berenson recalled that once, upon seeing a fake, he had felt an immediate discomfort in his stomach.⁷⁸ We are back to the guts. Here we have more than one expert talking about feeling physically sick or feeling an immediately unpleasant sensation in the stomach on seeing something that was intuitively wrong with a work of art.

In the Getty *kouros* case, from the perspective of the conscious mind, these judgments certainly appear to happen in a very thin ‘slice’ of time, so must depend on a thin ‘slice’ of information – right? Wrong:

these conscious reflections reveal little about what was going on in the art historians' unconscious minds. The expert who found himself staring at the statue's fingernails and the expert who judged it too fresh likely blended below awareness a large amount of physical or stylistic information to conclude the statue was a forgery. The inarticulateness of the judgments of most of the experts, on the one hand, and the credence they gave these inarticulate judgments, on the other, argues even more clearly for the complexity of the underlying patterns behind their conclusions.⁷⁹

There is a 'give and take' between the conscious and unconscious minds. We can consciously decide to hand over to the unconscious: thus it can carry on working while the conscious mind focusses on something else. We don't do this as often as we might. For a solution may only appear with time and unfocussed attention, allowing a broad survey of relevant material: 'mind wandering may ... allow otherwise opposing networks to work in cooperation.'⁸⁰ Note the suggestion that the unconscious mind is not disturbed, as the conscious mind is, by the coming together of (apparent) opposites.

Equally the decision to take more conscious control may arise, but that decision itself *arises from the unconscious*.⁸¹ All thought is ultimately intuitive in its provenance, in the sense that it is grounded in unconscious intelligence, which elects either to explore it consciously or not; much as our sight is macroscopic, and it is from that oversight of the world that we decide to take a close view of some detail through a magnifying glass – not the other way round. Most of what the unconscious mind knows, of course, never gets into the focus of awareness, but when it does so, it happens some while later: the unconscious shows signs of having solved a problem as much as eight seconds before the solution comes to consciousness.⁸² It is also of interest that both the heart and the brain appear to be able to anticipate an error in performance by musicians.⁸³

Clearly some decisions, detection tasks, and creative acts do require deliberation and cogitation, even focussed attention. It's just useful to be reminded of quite how much goes on *better* as long as it remains outside the spotlight of attention, since our immediate unexamined assumption, coming from the explicit articulate left hemisphere, is that we do everything better

when we are focussed on it and trying hard. In reality such occasions clearly do exist, but they are relatively rare. (I will consider a striking example later in this chapter.)

Before we leave this section, what about the time course here? The laying down of whatever it is we draw on when we speak of having gut feelings takes a while, and may go back a long way. But access to knowledge that is stored seems to take anywhere between milliseconds and several minutes, presumably depending on how much information needs to be retrieved from memory. We make judgments about a person's trustworthiness, competence, aggressiveness and likeability within the first tenth of a second, judgments which do not change significantly with added time.⁸⁴ This might go to show how accurate our first impressions are – or just how difficult it is to change them subsequently. But, either way, judgments on complex matters, that are hard to specify, are made almost instantaneously, and we generally feel no need to alter them.

EMBODIED COGNITION, PATTERN RECOGNITION AND THE EMERGENCE OF SKILL

Much of what we call intuition is the result of what John Kay calls ‘finely honed, well-developed skills’.⁸⁵ ‘Well-developed’ here means repeatedly exercised through practice, and it is on the grindstone of experience that our intuitions are honed. Even if they manifest as cognitive, they are embodied, in the sense that they are both informed by and inform the motion of our limbs, our breathing and pulse, the emotion of our heart and gut and mind, together with alert perception, and intelligent insight, all manifest in interaction with, rather than abstraction from, the world. Such intuitions are highly context-sensitive, responsible and responsive, not random or wilful; they are the fruit of disciplined attention to the world over time.

It is this kind of intuition, something that is grounded in praxis, not analysis, that is the decisive element in chess,⁸⁶ just as it is in calligraphy, or playing the cello.

Chess is often thought of as an analytic game, but it clearly is not: it is an expertise operating almost entirely at a non-conscious level. Deliberation does take place, but on a ready-made selection (typically not more than half a dozen) out of literally millions of possible future scenarios, and, contrary to what is often believed, does not necessarily look more than a few steps ahead. Professionals can play simultaneous games, sometimes against as many as 50 opponents, with only slightly less success than in games played under tournament conditions. In simultaneous play, the professional takes much less than a minute, often only a few seconds, for each move. There is no time for careful analysis, which, if systematic, would take thousands of hours. A chess expert is, rather, an expert at perception: it is skilled perception, not unaided memory, that enables the chess Grandmaster to memorise nearly perfectly a position that has been presented for a few seconds only, as detailed analysis of the eye movements of strong and weaker chess players, when confronted with a novel position, shows.⁸⁷

The difference in perception is that the expert already sees, not a mass of details that have to be organised by rules to make sense, but patterns that have meaning within the game. That their skill is a matter of pattern recognition, not just a photographic memory, is demonstrated by the fact

that though such experts are much better than normal subjects at remembering a board in a chess game after glimpsing it for a few seconds, this superiority to a great extent (though not entirely) disappears, if the task is to remember a random arrangement of pieces that has no meaning within the rules of chess.⁸⁸ It is worth watching the memory performance of chess Grandmaster Patrick Wolff, available on YouTube.⁸⁹ What is clear is that he is relying heavily on right hemisphere brain functioning: he talks of seeing coherent patterns that fit together in chunks right across the board. ‘You try to absorb everything quickly, but occasionally you overlook the details’, he says – but he had already demonstrated that he does not overlook any single piece *if it is important*, that is, if its presence or absence would in any way change the overall meaning of what is seen. Such a piece could not, in any case, ever be an isolated ‘detail’: it would be already bound into what he calls the ‘structure’. It is only the inessential that he forgets, with astonishing efficiency.

How good are we at knowing whether we have seen something before? The answer appears to be ‘very’. ‘A number of studies demonstrate that recognition memory is vast, easily etched on, and remarkably retentive despite short presentation times’, according to psychologists Gerd Gigerenzer and Dan Goldstein.⁹⁰ An experiment in 1967 by Roger Shepard had shown that immediately following a single exposure of 612 picture stimuli, for about six seconds each, subjects could select the correct picture in two-alternative recognition tests with a 98% success rate.⁹¹ Over the next few years, another psychologist, Lionel Standing, went further:

Standing increased the number of pictures (photographs and ‘striking’ photographs selected for their vividness) to 1,000 and limited the time of presentation to five seconds. Two days later, he tested recognition memory with pairs of pictures in which one had been presented previously and one was novel. Participants were able to point to the previously presented picture 885 times of 1,000 with normal pictures and 940 times of 1,000 with ‘striking’ pictures. Standing then outdid himself by a factor of 10. In perhaps the most extensive recognition memory test ever performed, he presented 10,000 normal pictures for five seconds each. Two days later participants correctly identified them in 8,300 of 10,000 pairs. When

more and more pictures were presented, the retention percentage declined slightly, but the absolute number of pictures recognized increased ...

This is despite the effects of fatigue: Standing himself reported that ‘in the case of 10,000 items, the cumulative effects of five days’ viewing ... are extremely gruelling and unpleasant’.⁹²

In his experiments Standing compared pictures and words, and considered that ‘the superiority of the pictorial mode in recognition and free recall learning tasks is well established ... recognition memory for pictures is almost limitless’. He was referring here to both accuracy and capacity. The average recognition time for words and images was less than a second when there were 10,000 objects. The unconscious memory can work on shapes, pictures and images, juggling many factors, in very short periods. Standing reckoned that, given a further second, the mind could search over 50,000 pictures in unconscious memory.

There are also things that can never be recalled because we weren’t aware of them at the time – yet we know them at some level. If ‘we’ don’t know that we know them, how can we be so sure? Well, we are much more than our conscious selves; it is variously estimated that around 99% of all that our brains take note of never needs to break into conscious experience. This, incidentally, partially explains the results of Libet’s well-known experiments (and the subsequent similar experiments of Soon and others)⁹³ – they are not a proof that in some spooky way our ‘brain’ makes decisions that ‘we’ don’t know about, still less that there is ‘no free will’. They merely require us to accept that we are more than our conscious minds, and that most of our decision-making goes on at a level below consciousness, something which, if it wasn’t already obvious, was made abundantly clear over a century ago by Sigmund Freud. Most of our knowing is ‘knowing without knowing why’, as psychologist Guy Claxton felicitously puts it.⁹⁴

When asked to find a fourth word that linked another three (such as HOME, SEA, BED) people are better than chance at discriminating a triad for which such a word exists from one which has no such word, even when they are not able to name the fourth word.⁹⁵

Sometimes this ‘knowing without knowing you know’ can manifest itself in some interesting ways. Fearful faces exposed for as little as 17-thousandths of a second, and then followed immediately with a neutral face

that ‘masks’ it, can nonetheless evoke a response in the amygdala, showing that an appropriate emotional reaction to the fearful face occurs, even though subjects are completely unaware that they have seen it.⁹⁶

In a condition known as blindsight, the primary visual cortex (also known as the striate cortex, or V1) has been destroyed or damaged in such a way that subjects are blind, in the normal sense of the word. Yet if asked to guess the presence and location of an object, they perform better than they could by chance. They can even ‘guess’ the colour and shape of an object or its orientation, and react spontaneously when something moves; and can catch something thrown at them, put out their hand and grasp, eg, a walking-stick by the handle, and recognise whose face they are looking at – yet they nonetheless insist that they see nothing.

A patient called TN, who was cortically blind, exhibited what is called affective blindsight. He was able to react spontaneously to facial expressions, with an appropriate emotional response accompanied by activity in the right amygdala, even though he denied that he had seen anything – and indeed, in the conventional understanding of the word ‘see’, he had not.⁹⁷ He was also able to walk down a corridor negotiating a range of awkward obstacles that had been placed in his path, some low to the ground, some higher – a bin, a tray, a tripod – and avoided every one of them. He had to squeeze up against the wall to get past a bin: when asked why he did it he said he ‘just felt like’ walking that way.⁹⁸

This phenomenon has been much debated by philosophers, who have used it both to support and to deny the existence of consciousness. But there is something very odd that is less often noted. Subjects with blindsight are both less surprised by their ability than we feel they ought to be, and at the same time, much less confident in their ability than we feel they ought to be – they carry on needing to be prompted to use it (as did Franck Mourier). Something like confabulation is evident. The conscious articulating mind, not knowing what is going on, prefers anything to accepting the truth of the matter – that we are getting along OK without its input. The situation is similar to that found in split-brain patients, when the right hemisphere is aware of something that the left hemisphere is not, and the left hemisphere, nothing abashed, constructs a story to make sense of what has just happened, without having a clue as to what actually did.

Aristotle distinguished three kinds of knowledge: *episteme*, *techne* and *phronesis*. They don’t have exact equivalents in English, but they can be

explained without too much difficulty. *Episteme* is abstract, context-independent, invariant and general. It is based on analytical reasoning. In our terms, it represents the left hemisphere in action. *Techne* is the skill of the craftsman: practical, embodied, flexible and dependent on context. *Phronesis* is a kind of pragmatic wisdom, which involves the appreciation of values, is more reflective, but is also flexible, tacit, intuitive and context-sensitive like *techne*, to which it is closer than it is to *episteme*. Both *phronesis* and *techne* show signs of being more right hemisphere-dependent. Aristotle also distinguished *nous* (intuition) and *sophia* (another kind of wisdom). These are each harder to put into modern English terms, but *nous* is something like the intellectual spirit that enables us to reason at all, while *sophia* (the root of our word ‘philosophy’, and usually translated as wisdom) interestingly covers a very wide range of experience, bringing together, more clearly than any other, what is conventionally seen as the ‘lowest’ level, embodied wisdom, with ‘highest’ level, inspired (or divine) wisdom. In ancient Greek thought, these were not sundered: Homer is, for example, able to speak of the *sophia* of a shipbuilder,⁹⁹ and Theocritus of the *sophia* of a tapestry-weaver.¹⁰⁰ At the same time, the word may also mean insight into the deepest nature of things by a poet or thinker. It is also often used interchangeably with *phronesis*, the wisdom of judgment that comes with experience.

Most importantly, Aristotle realised that different kinds of knowledge were appropriate to different contexts, so that the knowledge of an accountant was of a different kind to that of a physician, and each was different from that of a sculptor.

What sorts of knowledge are needed to develop expertise? And what role does intuition play? Those of you who have read Daniel Kahneman will likely have a somewhat jaundiced view of expertise. What Kahneman says should not be ignored: I will come to that in the next chapter. But meanwhile what *does* make an expert?

You need to start by consciously learning a very great deal, for years; but in the long run that will never make you an expert. There are far too many options to consider for you to cover them all in the time available – which is not to say that experts don’t think or deliberate. They very definitely do. But it is important to know how much, and when, to do so. Too much self-awareness, or self-awareness at the wrong moment, will not

help; indeed it will positively get in the way of good judgment or good practice. Judging that, too, is part of expertise.¹⁰¹

In this, expertise is like a Japanese martial art,

full of balancing acts that demand the application of rigorous technique and the surrendering of the self to its most intuitive state. In Kendo, rigour is acquired through strictly repetitive drills, and flexibility only becomes possible when the fencer is proficient enough to ban all thought of rigorous technique and respond intuitively.¹⁰²

Something similar applies to being an experienced physician. As a medical student starting out on the wards, I had learnt a colossal number of pieces of information – several a minute, on average, it certainly seemed – over the previous three years. At times it had felt like trying to drink from a fire hose. Yet for all that, I was completely at sea when it came to putting what I had learnt into practice. As part of my training, I was encouraged to introduce myself to patients and take their history. I particularly remember that, as a medical student, after almost two hours of listening to one poor middle-aged lady, I had no clue what was wrong with her. She wore wrist splints and, having tried to kill herself, was brought in in a wheelchair to a general medical ward: she seemed to have complex problems in every system that I enquired about. I despaired. I had millions of facts at my disposal but not enough pattern recognition to do anything the least bit helpful with them. Another thing I had yet to learn was that just sitting and giving her undivided attention for a couple of hours was quite possibly, in her case, as therapeutic as anything I could offer. But knowing that also involved recasting what I saw according to experience that at that stage I didn't have. I was desperate not to have missed a mechanism.

On the wards where I was trained, each general medical team would take it in turn to be the one to accept the medical emergencies that came in during a 24-hour period: this is known as being 'on take'. At the ward round the morning after being on take, as a House Physician, the lowest form of medical life, I would watch the Registrar, a qualified doctor with a middle rank in the team, having probably about three or four years of postgraduate experience, and having like me been up all night, move from

bed to bed, presenting to the Consultant, without notes, a concise history, findings on examination, and the results of any investigations and procedures that had been carried out, for each of about 25 patients. And I wondered how on earth he could remember so many details:

This gentleman is a 67 year-old retired miner, a lifelong smoker, with a family history of heart disease, a history of type II diabetes controlled by diet only, and hypertension currently poorly controlled by atenolol. He had recently experienced increasing fatigue and presented in Cas at 4 am, after his wife called an ambulance. She was worried, as he had become increasingly short of breath, was wheezing and showed signs of confusion. On arrival he was poorly perfused, with cold peripheries, BP was 130/95, he had a raised JVP, some wet rales, signs of cardiomegaly and an S3 gallop, a palpable liver edge at 2cm, and some pitting oedema. On direct questioning he admitted to a cough, but denied paroxysmal nocturnal dyspnoea. An ECG showed some Q waves, left axis deviation, but no ST elevation. His sodium came back at 124, potassium at 5.2 (we will repeat these later today), slightly elevated transaminases. We put him on nitrates, an ACE inhibitor, a furosemide drip and CPAP, and he is currently stable.

And then, after the Consultant had nodded and asked a few pertinent questions, and checked that an ‘echo was in the pipeline’, he’d walk on to the next bed and start all over again. How on earth did he do it? Was he a memory freak? To me it all seemed a bewildering mass of fairly unpredictable details.

But, like the chess player, he was using pattern recognition. There were half a dozen common possibilities here, and a number of less common ones. Enough details cohered to suggest what was most likely congestive cardiac failure; and once you have a template, you know what fits and what doesn’t – each becomes easy to remember for different reasons. All quite routine, really...

And then there were the astonishing feats of diagnostics involving rare and unusual conditions, which could be expected only from senior clinicians, those with the greatest experience. I have frequently had reason

to be genuinely in awe of the acumen of senior neurologists, general physicians and radiologists with whom I have worked.

Experts in any field need both to attend to the *Gestalt*, the picture as a whole, and, occasionally, to engage in (preferably limited) analysis. Why preferably limited? Because it has costs. It takes time, yes; but worse, it also changes its object, risks focus on areas that may be inessential, risks substituting something explicit and measurable for something much more important that is implicit and unmeasurable, and inevitably interferes with the functioning of expert skills, as we have seen in earlier sections of this chapter. As Whitehead said, such analytic forays ‘require fresh horses’, and must only be made at decisive moments.

Researchers into medical expertise have investigated the role of perception and memory in the decision-making ability of novice, as opposed to expert, physicians.¹⁰³ Physicians develop ‘illness scripts’ for diseases through experience.¹⁰⁴ They then verify the script against the information provided by the patient: as long as it matches the script, this is an unconscious process.¹⁰⁵ Experience, as in chess, changes what you see when you look, and how you relate it to what you remember having seen. Expert chess players’ fixations are to one side of specific pieces and near the centre of the board, whereas novices more often fixated a single piece at a time. Novices were found to activate only left hemisphere areas, whereas the attention paid by experts recruited the right hemisphere over and above the left.¹⁰⁶

Similarly, experienced radiologists were found to apply a ‘global’ analysis of mammography images in detecting breast cancer, their expertise reflected in a shift from detailed scanning of the image to a holistic, *Gestalt*-like perception.¹⁰⁷

A general surgeon in the US wrote to me to say that he found that he needed a way to keep tabs on a large number of patients, for whom all the technical assessments and investigations were carried out by his ‘residents’ (junior doctors). Every day he would stroll through the ward, doing what appeared to be social rounds. In reality he was comparing each patient’s face with how it had been the day before. ‘To my surprise’, he wrote, ‘I knew which patients were getting into trouble two or three days before even the best residents had a clue.’

Jerome Groopman has written a book-length study of the way doctors think. He notes that they blend *Gestalt* appreciation with deliberate analysis

in more problematic cases, and that this requires time.¹⁰⁸ But he is worried about the computer-like procedures involved in clinical algorithms:

Clinical algorithms can be useful for run-of-the-mill diagnosis and treatment ... but they quickly fall apart when a doctor needs to think outside their boxes, when symptoms are vague, or multiple and confusing, or when test results are inexact. In such cases – the kinds of cases where we most need a discerning doctor – algorithms discourage physicians from thinking independently and creatively. Instead of expanding a doctor's thinking, they can constrain it ... Statistics cannot substitute for the human being before you; statistics embody averages, not individuals.¹⁰⁹

Reliance on clinical 'instruments' for decision-making is fashionable. It is considered culpable, for example, not to administer one to a psychiatric patient so as to assess risk of self-harm. However, as I and my colleagues had long suspected, and confirmed through experience, instruments for predicting suicide turn out to be effectively useless. According to recent research:¹¹⁰

Risk scales following self-harm have limited clinical utility and may waste valuable resources. Most scales performed no better than clinician or patient ratings of risk. Some performed considerably worse.¹¹¹

These rote procedures induce complacency, encourage nursing staff to take their eyes off the ball, and to mistrust their intuitions. My most valued 'suicide detection instrument' was the acumen of an untrained auxiliary nurse with 30 years' experience on the wards. Auxiliary nurses often spend more time talking with and quietly observing patients than their trained colleagues; her having an 'uneasy feeling' about a patient was a sign worth heeding. Such intuitions are only useful, however, when they emanate from someone with experience, not from a novice.

The asking of routine questions and ticking of boxes can also make the patient feel reduced to a formula on a piece of paper, rather than truly attended to as an individual. This also makes the clinician seem more like a

technician than a nurse or doctor, thus lowering the clinical potential for helping an individual desperately in need of empathic engagement. And it lowers the morale of both clinician and patient. *Ars est celare artem* – or, to quote Valentine and Gabbard, ‘technique, in general, should be invisible. The therapist should be viewed by the patient as engaging in a natural conversational dialogue growing out of the patient’s concerns; the therapist should not be perceived as applying a stilted, formal technique.’¹¹² In my training, I watched my mentors effortlessly elicit aberrant psychic phenomena in a few minutes that I had failed to elicit in a considerably longer interview. If I eventually had a skill as a psychiatrist, it was to make sure that I covered every aspect of a patient’s life within an hour of what appeared to be a naturally unfolding conversation, so that patients would exclaim, ‘I have never spoken about this – you now know more about me than my partner [or parents or children].’ And to see the *Gestalt*.

There is much more to be said, but not here, about the obsession with algorithms, correct procedures and ‘evidenced-based medicine’, on the pitfalls of which Groopman is devastatingly clear.

Please note that, as ever, observing that we have become excessively reliant on a certain way of thinking or doing things, whatever it may be, does not imply there is no good in it at all, or that it should be wholly abandoned – only that it needs to be balanced with other elements, as just one strand in a coherent whole. Every sensible doctor will want to take into account the findings of clinical trials – though they have problems of reliability all of their own, as we have seen – but will also realise that such findings can only help shape, not substitute for, his or her own reflections on experience with various treatments.

Dreyfus and Dreyfus, like others, distinguish different phases through which the novice passes on the way to becoming a highly skilled expert. They delineate five, but for these purposes the detail does not matter as much as the clear overall shape. In brief, they show that in the first three phases, in different ways and to different degrees, having a procedure or algorithm to follow improves performance; but that in the last two phases such explicit modelling impairs decision-making and destroys the possibility of excellence. It enforces mediocrity. Intuition is what makes good judges, good physicians and good generals, as well as good teachers, pilots, poets, artists and leaders. Of course they need to have learnt and thought a lot – intuition is not in conflict with that, but indeed depends on it.

Nor is there anything that says that intuitions have to work fast: sometimes an intuition must guide us in a split second, but sometimes it unfolds over hours, weeks or months.

They summarise the expert's skill as 'pattern recognition, similarity recognition, common-sense understanding, skilled know-how, sense of salience and deliberative rationality.'¹¹³

It is not that experts are better at recall, or have a gift for analysis: we saw an example of that in expert chess players. It is those at an *intermediary* level that are best at explicit recall and reasoning, because, although they have more of an idea than the novice, they don't yet have the rich schemas of the expert.¹¹⁴ Just as we saw that understanding was achieved by innovative mathematicians and scientists through visual imagery, experts' judgments are strongly shaped by visual concepts derived from previous experience.¹¹⁵ This inevitably means that their explicit verbal accounts of how they proceed non-verbally and implicitly will not be accurate, and should not be taken as a model. The mathematicians and scientists we met in Part I were often at a loss to tell how they had arrived at their conclusions. In solving problems in geometry, experts do not pass through intermediate steps, but employ prototypical schemas.¹¹⁶ In physics, experts match schemas to features of the problem: novices and advanced students, by contrast, work from the bottom up, not having the schemas.¹¹⁷ Expert physicians, psychiatrists, nurses, judges, soldiers and businessmen may all reach decisions in ways that are not dissimilar.

There is a distinction to be made – and the Dreyfuses make it – between calculative rationality, which is what computers do, from the bottom up, and deliberative rationality, the last reflective stage for the true expert, in which reason may act on intuition.

When time permits and much is at stake, detached deliberative rationality of the type described [leading to a deliberately taken new perspective] can enhance the performance of even the intuitive expert. We reiterate, however, that such deliberation tests and improves whole intuitions. No rules or principles are used to arrive at conclusions, and so it is not the sort of calculative rationality used by the beginner or competent performer as a surrogate for intuitive understanding.¹¹⁸

Translating this into terms of hemisphere-typical function, the work of the left hemisphere is valuable, but should, as always, be secondary to that carried out by the right hemisphere. And Dreyfus & Dreyfus might have added that only intuition tells us *when* to invoke the specifically analytic processes – there are no rules for that, either.

Both explicit and implicit knowledge contribute to adaptive decision-making.¹¹⁹ Why ever would they not? Both meet in pattern recognition, the appreciation of the *form* of something, not just the pieces packed inside the form. This is where *logos* and *mythos* meet.

But unfortunately the logically fettered mind can never come to know what it is it doesn't know:

To the extent that junior employees using expert systems come to see expertise as a function of large knowledge bases and masses of inferential rules, they will fail to progress beyond the competent level of their machines. With the leap beyond competence to proficiency and expertise thus inhibited, investors in expert systems may ultimately discover that their wells of true human expertise and wisdom have gone dry.¹²⁰

There is a difference between knowing a poem by heart and knowing where to find it in a book. There is a difference between the embodied experience (and a lifetime's reflection on it), that distinguishes a capable judge or a capable physician, and the following of flow diagrams or application of rules that could be done by a clever teenager. Knowledge that is so far assimilated as to have become part of us changes us, and enables us to be competent practitioners. A doctor is not infallible, but neither is a machine: the more the doctor's knowledge is externalised – outsourced to the following of an algorithm or a computer – the more deskilled he or she becomes. And a deskilled doctor is no good to a patient: something more like an investment adviser, able to summon up figures on a screen, deliver the news of what is in your account, and sell you the package the machine advises.

Doctors have not been as closely studied as nurses. In the world of nursing, Patricia Benner notes that becoming an expert means shifting from

abstract principles to seeing intuitively the patient before you in relation to other real-life experiences, and noting similarities and differences.

She also emphasises three other features of expertise, each of which can be seen as a shift from left hemisphere to right hemisphere 'mode': a change from viewing separate pieces of information to perception of situations as a whole; a 'fluid, flexible' performance; and the 'passage from a detached observer to an involved performer, no longer outside the situation but now actively engaged in participation'.¹²¹

Benner recognised that nursing was poorly served by theories developed in the academy, and introduced the (nowadays) revolutionary idea that the practice itself could and should inform theory.¹²² As a result her ideas are open to criticism from more conventional quarters for not being quantitative, and for using narratives.¹²³ Remember once again that the left hemisphere is more interested in quantification than qualification, and distrusts narrative – indeed has difficulty understanding and seeing the point of narrative at all. Equally, because her model relies on experience, which partly comes with age, rather than rules which any person (or machine) could follow, it has been argued by some that she represents a step back into tradition and authority in nursing.¹²⁴ Though the left hemisphere's theory may dictate that each person is effectively the same as and replaceable by any other member of the category, the right hemisphere is aware of individuals as individuals and that learning comes from living. The words 'tradition and authority' are here being used as boo words for what is merely common sense – namely that we learn best from those who have more accumulated experience, and have had more time to reflect on it, than we have. Not to recognise that fact is a sort of self-inflicted disability.

In fact such clinical skills are inevitably those of a real individual, here the skilled nurse, in relation to another real individual, the patient in question. It is as much about knowing the patient, as it is about knowing facts.¹²⁵ And, interestingly, experienced nurses recognise not just the importance of their own intuitions, but the importance of the patients' own intuitive feelings.¹²⁶

A number of studies have established that intuition in nursing is real and indispensable.¹²⁷ Attending to past experience improves nurses' judgment.¹²⁸ It is not mystical or somehow 'unscientific'.¹²⁹ Many nurses in practice feel that they should not be using intuition in reaching decisions and find

that it is often denigrated by managers, their own colleagues and doctors.¹³⁰ However, a lack of intuition means that patients may receive inappropriate or incomplete care; and, despite formal discouragement, most nurses persist in putting their intuitive knowledge to use.¹³¹ What is more, incorporation of intuition into judgment increases with expertise – which is as it should be, since the gut feelings of novices should not be equated with experienced intuition.¹³²

What is involved appears to be a rapid process of perception, happening below the level of conscious awareness, and bringing to bear neither abstract cognition on its own, nor the promptings of feelings alone, but their fusion in an intelligent understanding of the situation as a whole. The process is fast and frugal, in Gigerenzer's phrase, and can work with only partial information.¹³³ The reader will recall from Part I that that, too, is a classic hemisphere difference: the right hemisphere is superior where information is only partial, or partially degraded – which is mostly the case in real life.¹³⁴

CONCLUSION

Intuition appears to be something that, while inevitably fallible, is often more reliable, much quicker, and capable of taking into account many more factors, than explicit reasoning, including factors of which we may not even be consciously aware. It also underlies motor, cognitive and social skills, and is the ground of the excellence of the expert. The attempt to replace it with rules and procedures is a typical left hemisphere response to something it does not understand – a response that is, alas, powerfully destructive. We inhabit a world in which reason is needed more than ever before, yet in which reason is so narrowly conceived that it drives out true understanding. For that we would have had to learn respect for the power of intuition, not as opposed to reason, but as both grounding it, and the means for it to fulfil its potential in making judgments in life.

In *Also Sprach Zarathustra*, Nietzsche wrote: ‘The body is a great sage, a *Many* with *One* purpose, a war *and* a peace, a flock *and* a shepherd ... There is more sense in thy body than in thy best wisdom.’¹³⁵ He saw that what he calls the ‘body’ (namely, all that lies outside the conscious stare of the left hemisphere) understands a purpose that includes the free and the determined together, conflict and harmony together, multiplicity and unity as one; and understands that opposites coincide. Words that are worth bearing in mind throughout the rest of this book.

THE UNTIMELY DEMISE OF INTUITION

My concern is with a movement or programme which is aimed at ultimately bringing the body entirely under control of the mind.

—Patrick Curry¹

IN OUR DISCUSSION OF SCIENCE AND REASON AS APPROACHES TO TRUTH, WE came time and again upon the implicit belief that truth could really be grasped only if the embodied human being, with its distastefully irrational feelings, prejudices and instincts could somehow be got out of the way. According to this belief, human beings are inherently fallible and it is this human element that is the source of error; only by expunging it can there be any hope of approaching truth. Of course human beings are indeed fallible, but this false belief that we must transcend the human in order to approach truth is both in itself irrational, and leads, as I suggested, to exaggerated claims for the truths of science and to a narrow sense of reason that equally misleads. It is, I'd suggest, this allergic attitude to the human and to inherent human fallibility that lies at the heart of the mistrust of intuition. For, as we have seen, intuition draws the products of its understanding straight from the body and places them instantly on the table, as it were, without the chance for the left hemisphere first to clean it all up, wash off the traces of the human innards and re-present it all as something purer, free from the stain of the human and so more 'objective'. Intuitions come from the 'guts', for heaven's sake: if one is going to look for truth from such a

source one may as well put one's faith in the Pythia's reading of the entrails of a chicken.

So it is not surprising that psychologists like thinking up what one might call 'illusions of intuition', cognitive equivalents of the chequerboard at the beginning of the previous chapter, to show how foolish we would be to trust in intuition. It's an observation worth pondering that this may have little to do with how psychologists, philosophers and other theorists actually behave in real life. As philosophers Andrew McGee and Charles Foster put it:

We [both authors are academics] spend a fair amount of our time with people who, for money, prestige and because they think it's the right thing to do, try not to be intuitive. Universities are full of them. But here's the thing: they are only non-intuitive at the office – and only very, very inconsistently there. As soon as they push open the Faculty door and leave for the real world of relationship and sick children, they're immediately and unavoidably back in the atavistic world of the Upper Palaeolithic that they officially fear and repudiate.²

By definition, psychologists belong to a class of people who generally like taking things apart to see how they work, and therefore intuitively dislike the idea that results can be had without working explicitly through the logical steps. And of course they are right – up to a point. It would be as foolish to assume that intuitions will always lead to the right answers as to assume that pure rationality will.

Intuition is capable of fooling even those who might be regarded as supremely rational and therefore most immune to it. Take this, for example:

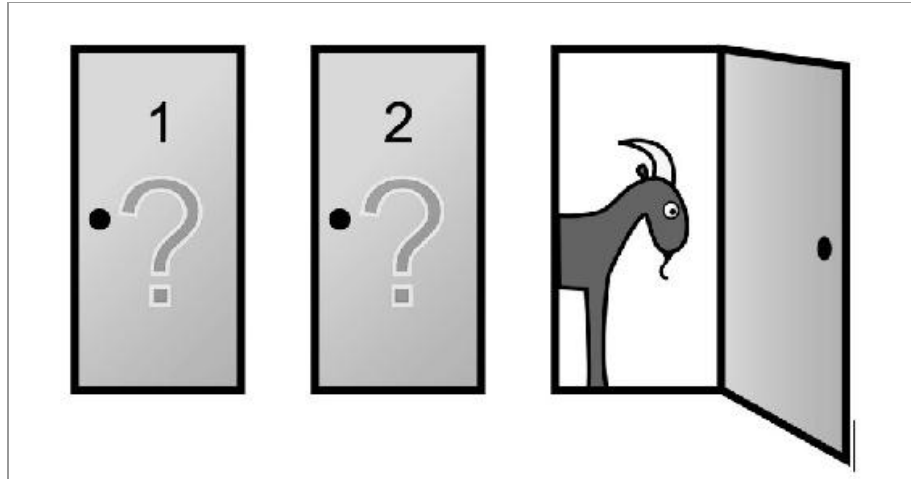


Fig. 35. The Monty Hall Dilemma

It is called the Monty Hall Dilemma, named after an American TV game show, a problem that defeats some of the world's greatest mathematicians, and is arguably better solved by pigeons than humans. So why do I say that conscious focussed reasoning works?

The problem is simple and can be briefly and completely stated. A contestant chooses one of three doors, knowing that behind one there is a smart new car, but behind each of the other two there is a mangy goat: there is no way of telling which. After the contestant selects a door – at this stage still unopened – the host (Monty Hall) reveals a goat behind one of the *other* two doors. The contestant is then given an opportunity to switch from his or her original choice to the other still unopened door. Most individuals decline – despite the fact that switching would double their chance of winning.

Double their chances? How could it possibly change them at all?

Here's the explanation:

The probability that a participant will randomly select the door with the prize on the first guess is one in three, because there is one prize and three possible locations. If the initial selection is the winning door, then after the host reveals one goat, it follows that the second goat must be behind the remaining unselected door. Thus, on one-third of all trials, staying wins and switching loses. In contrast, the probability that a contestant will not choose the door with the prize

on the first guess is two in three. If the contestant's chosen door conceals one goat, and the other goat has been revealed, then the remaining door must conceal the prize. Thus, two-thirds of the time, switching wins and staying loses.³

If you still find this difficult to comprehend (and I assure you it is correct), take some comfort from the fact that even prodigiously clever mathematicians find this hard to get. They seem to be fixated on the idea that the facts of the situation haven't changed. True. But our information about the situation *has*. And since a rational choice should be based on all the information, not just the information we started out with, it makes sense to change when you know something new that alters the odds. Paul Erdős, one of the greatest mathematicians of the last hundred years and a specialist in probability theory, thought it was impossible that switching made any difference, and got angry when a colleague tried to explain it to him – though some days later he conceded the point.⁴

The problem was submitted to Marilyn vos Savant for comment in a magazine column she ran for many years looking at mathematical problems:⁵

She answered the question of 'to switch or not to switch' by saying, 'yes, you should switch', and gave her explanation. In a later column she published signed letters from 4 PhDs (some quite nasty and sardonic) which severely chastised her for misleading and corrupting the public. Later she gave an alternate explanation. In a still later column she published letters from another 5 PhDs, who all called her an idiot.⁶

In a simulated lab version, humans can be brought to a point where they get the idea that they are better to switch, but they still only actually switch about two-thirds of the time, because they indulge in what is called 'probability matching': they try (wrongly) to match their awareness that they will win only two-thirds of the time, by *doing the right thing only two-thirds of the time*, so that they score only a little above chance. The sad fact of the matter is that pigeons do better: they learn that they do better to switch every time, and thereby win 67% of the time. And the most likely

reason they do better is that they learn from experience, and don't let 'reasoning' get in the way: after 200 trials, humans largely failed to adopt the optimal strategy that the pigeons had quickly mastered.⁷

This has relevance to the hemisphere hypothesis. In an unconnected experiment with split-brain patients, the subjects were asked to guess which colour, red or green, was going to be displayed next, in a series where there were four times more green than red lights displayed. The right hemisphere saw – like the pigeon, though unlike the pigeon it saw it immediately – that the way to get the best score was to choose green every time, leading to a score of 80%; the left hemisphere chose green at random, but about four times more often than red ('probability matching'); which sounds smart, but is illogical, since you have no way of knowing what the next colour will be. As a result of being smart, the left hemisphere scored little better than chance. It had developed a 'rule', but the rule was wrong.⁸

What can one learn from this? First, that reasoning can of course be helpful, but only if you can be certain your reasoning is right – which apparently even mathematical geniuses can't. Failing that, reasoning will mislead you: and being attuned to what experience tells you (pigeon fashion), without letting the attempt to reason get in the way, is safer – though it may take a while longer. Thinking slow?

So of course it is true that intuitions can lead us astray. But does that mean that they are worthless or, at the very least, dangerously unreliable? The case for believing so seems to derive from suspicion of the apparent instantaneousness of intuitive knowledge. It comes unexamined. It arrives without having been put through the wringer of critical scrutiny. The truths it claims to offer have in some mysterious way been cooked up beforehand, 'pre-judged'. In short, intuition peddles prejudices not truth.

That is a charge we need to take seriously. I will argue, however, that this account fails to invalidate intuition because it is based on a number of illusions, quite apart from the fact that intuition is clearly a far richer phenomenon than any form of prejudice. These illusions include: that human beings can *ever* avoid prejudice, in the sense of forming judgments from experience of the past to help them deal with the future; that an analytic training in science, or education in modern Western academic practices reduces the likelihood of such prejudice; that prejudices are largely mistaken; that prejudice inevitably issues in bias; that bias is not normally subject to correction as soon as a judgment can be made on more

than the barest outline; and that even if we were able – which clearly we are not – systematically to substitute reason for intuition, we would be guaranteed against bias.

In the 1960s and '70s academic psychology became dominated by an urge to demonstrate that human ways of thinking, dealing with aspects of experience in memory, and understanding the world through intuition, were radically flawed. This coincided with the espousal of the idea of the brain as a computer, a calculating machine, encoding, storing and retrieving data from memory banks; 'by the standard of decontextualized and literal processing of information on a computer hard disk, the human mind was a poor performer', says psychologist Brady Wagoner.⁹ We were seen as lazy, inefficient, 'cognitive misers'. As he points out, however, 'this focus on identifying error and distortion obscured important, non-mechanical dimensions of mind and the study of accuracy as more than what a computer does with information.' Part of the legacy has been a common conviction that compared with an ideal form of computing that would be carried out by a machine, we are prejudiced – and therefore almost bound to be wrong in making judgments.

PREJUDICE VS BIAS

I quoted earlier Douglas Hofstadter to the effect that ‘isolated reasoning is impossible, because reasoning depends on a prior setting-up of a system of concepts, percepts, classes, categories – call them what you will – in terms of which all situations are understood. It is there that biases and selection enter the picture.’ ¹⁰ Necessarily so – not just by an unfortunate accident. And the fantasy that machines could somehow produce unbiased outcomes that human beings, flawed as they are, can’t, is, to say the least, naïve. Partly, there is no such thing as avoiding a point of view, which is why it is important that the fact is recognised; and that it is recognised that the point of view is the result of reason combined with thoughtful experience, not just any old bias someone happens to have at the time. A machine that ‘learns’ has no thought or experience, but incorporates any imbalances or biases in the data from which it ‘learns’ as well as those that will be built into the ‘decision-making’ processes coded into it by human programmers – who are not necessarily any better at spotting either kind of bias than anyone else. Such systems learn the biases of their programmers and trainers. A dyslexic naturalist friend of mine asked Siri how to spell *tiercel* – the word for a male hawk, as she explained to Siri. Siri replied to the effect: ‘What’s all this about gender? It shouldn’t matter which gender it is.’

If we are foolish enough to imagine that machines avoid bias, the now concealed bias is all the more dangerous. We also know that interactive systems tend to gather information from and produce it for people who think in similar ways, insidiously compounding biases: this tendency, well known to be built into internet search mechanisms, and reinforced by the ‘blogosphere’, produces potentially toxic ‘bubbles’ or cocoons of bias, in which people feel justified by the fact that they only ever hear confirmatory points of view. We overestimate the sameness of out-groups compared with our in-group. ¹¹ Since the right to express competing and contrasting points of view is the very core of democracy, and since hearing competing and contrasting points of view is the basis of education, and therefore, once again, of an informed democracy, and since without it creativity and all forms of innovation quickly wither away, this is of first-rank importance.

Taking a much broader view of the topic of pre-judgments (*Vorurteile*), in his magnum opus *Truth and Method*, the philosopher Hans-Georg Gadamer urged that prejudice-free knowledge is neither possible nor desirable. Gadamer argues that prejudices are not necessarily vicious, and that the Enlightenment had a ‘prejudice against prejudice’.¹² Prejudices cannot be done away with: they are replaced only with other prejudices, sometimes better, sometimes worse, and we should bear in mind that the more historically unusual they are, the less we have to go on in assessing their accordance with reality. It is not our duty to be without prejudices, but to be aware of them – including the prejudice against prejudice – and examine them unremittingly, abandoning one prejudice in favour of another if we find the first does not accord with experience. It requires experience and good judgment to know when to retain, and when to reject, a prejudice. We cannot possibly make all – or perhaps any – of our own judgments from scratch: the idea that it would be feasible, never mind commendable, for us to reject completely the accumulated wisdom of humankind, and start again on the basis of our own limited knowledge and intellect, is a species of arrogant folly. On the contrary, writes Gadamer scholar Lauren Barthold,

prejudices are the very source of our knowledge. To dream with Descartes of razing to the ground all beliefs that are not clear and distinct is a move of deception that would entail ridding oneself of the very language [since language embodies a tradition of thought] that allows one to formulate doubt in the first place ... To affirm, as Gadamer does, that one can never escape from one’s tradition, does not mean he is insisting we endorse all traditions writ large ... accepting the fact that one can never entirely reflect oneself out of tradition does not mean that one cannot change and question one’s tradition. His point is that in as much as tradition serves as the condition of one’s knowledge, the background that instigates all inquiry, one can never start from a tradition-free place. A tradition is what gives one a question or interest to begin with.¹³

And a tradition is a body of beliefs which exists apart from and prior to any particular set of circumstances – prejudices, if you like; except (and this is Gadamer’s point) to call them such is to invite unthinking dismissal,

given the intellectual tradition to which we now belong. Even those who revolt against tradition are doing so as part of a, now venerable, tradition – that of the seventeenth- to eighteenth-century Western Enlightenment. You cannot *not* belong to a tradition.

But – here’s the point – a tradition is never static: if it were to become so, it would die. It is there not just to oppose change but to inform it and guide it. It is a living thing, a process of change in response to new circumstances. It is reverberative and responsive, not linear and fixed: forever in flow. Nonetheless, there is a difference between organic change and forced or abrupt change, as there is a difference between training a climbing plant and cutting it off, or uprooting it. A tradition changes by being born anew in each member of the community that shares in it. It is, above all, lived:

To embrace a tradition is to make it one’s own by altering it. A passive acknowledgment of a tradition does not allow one to live within it. One must apply the tradition as one’s own.¹⁴

In this respect, it is obvious that we are each only what we are, only think what we think, only believe what we believe, and love what we love, against a background of shared meanings within a culture and a landscape from which, though individual, we stem, in which we are never wholly separate one from another, and in terms of which ‘meaning’ has meaning. The rightful rejection of the Cartesian fantasy of an isolated, decontextualised, rational mind, hopping around the universe accessing uncontaminated truths, is at the heart of the last hundred years of philosophy in Europe, and is what Heidegger, Scheler, Merleau-Ponty and others were striving to achieve and to communicate. Not to have affections, not to have affiliations and loyalties, not to have love, but only reason to act for us in understanding what we do and who we are, is literally a form of madness. Nonetheless, Jung’s concept of the collective unconscious and its archetypes is another way of conceiving this broad implicit understanding on which we depend, one that takes up the individual tradition and, without eroding its identity, sets it in communion with other traditions. One of the striking things about research into implicit beliefs, whether one calls them intuitions or prejudices, is how constant they are across widely different cultures.

A prejudice literally means a pre-judgment. We inevitably make generalisations in order to guide action when we have little to go on, or little time to weigh up all the factors in a deliberative fashion, which is almost all the time. We couldn't survive if we did not, since having time to deliberate all the aspects of a situation is rare. Nor would we survive if the generalisations were not reasonably reliable, even though they are primarily of practical value, and cannot be other than highly fallible guides to the truth of particular instances. The knowledge that tigers are dangerous has survival value, and is not disproved by one friendly tiger, though it's not true in that particular case. The knowledge is drawn from general experience in advance of the situation, not from the particulars of the actual situation; which does not in itself make it unintelligent, imperceptive or factually wrong. In fact it would be foolish – indeed impossible – not to draw conclusions from experience to date. Thus pre-judgments are rational. I would argue that prejudice is usually a derogatory term for what we cannot help imbibing from experience, even if we wanted to, and indeed *must* imbibe if we are to live as fully functioning human beings.

However, prejudices can be based on ignorance, rather than experience; and even one based on experience is, obviously, ugly and harmful when it is incommensurate with that experience, or, very importantly, substitutes the category for the individual. Prejudice and bias are not the same thing. But, as I hope to show, you can be prejudiced without being biased – which is just as well, because otherwise unbiased judgments would be impossible, since we all have prejudices. In many cases, however, prejudice and bias concur. Some degree of bias in favour of what you believe, is inevitable – otherwise you wouldn't believe it, would you?

Such a bias has, as it turns out, nothing to do with intelligence, as you might expect. A large body of research suggests that, to quote one recent paper, 'high intelligence is no inoculation against my-side bias'.¹⁵ In other words, intelligent people are every bit as likely to have biases as less intelligent people – and to deny their own prejudices. Nor does the quality of causal reasoning about an issue relate to intelligence, apparently.¹⁶ Being a scientist doesn't help, either, by the way: there is ample evidence, some of which we have already looked at, that scientists are no less prone to bias than anyone else. Indeed, some evidence shows that people with more education are *more* likely to cling to ideological beliefs in the teeth of evidence.¹⁷ They also express less racist views, but show more implicit

racially aversive responses (ones that cannot be controlled): they say one thing, but believe another.¹⁸ And interestingly, an investigation into belief in pseudoscience found that it was associated with analytic, but not intuitive, thinking style:

After controlling for demographic variables, level of science literacy and cognitive ability, both analytic and intuitive cognitive styles positively predicted paranormal belief. Belief in non-paranormal pseudoscience associated positively with analytic, but not intuitive style.¹⁹

On the topic of scientific bias, an aside: the astonishing apathy about climate change is not a matter of scientific ignorance, more about bias. Those members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about the issue, but they were the ones with the most polarised views. ‘This result’, write the authors of the study that reached this conclusion,

suggests that public divisions over climate change stem not from the public’s incomprehension of science but from a distinctive conflict of interest: between the personal interest individuals have in forming beliefs in line with those held by others with whom they share close ties and the collective one they all share in making use of the best available science to promote common welfare.²⁰

Groupthink so often rules, because membership of the ‘in’ group is more important than using one’s critical faculties, and even *questioning* an established fashionable idea can lead to exclusion and vilification.

Groupthink is the danger. Groupthink will lead people to mistrust both their senses and their intuitions. In a now famous experiment, subjects were told that their vision was being tested, and asked to say which line, in an array of three, was closest in length to a target line.²¹ The answer was obvious. However, stooges were set up to give the same, obviously erroneous, answer – after which the naïve test subject, in a third of trials, fell in with the majority, despite knowing it to be false (though, chillingly, some participants even started to believe the majority were right). This is

one reason why it is of the utmost importance that there be dissenting voices, since the presence of even one dissenting voice reduced conformity by 80%.²²

In fact, being less dispassionate – more emotionally involved – with a topic leads to your being *more* willing to listen to evidence, rather than less. It matters to you more. It turns out that when people have low investment in an argument, neither strong nor weak arguments are persuasive. Their minds are made up, and no argument shifts them. But when they are highly involved with an issue, both strong and weak arguments have a significant effect, in the way that you might hope: weak arguments making people more entrenched, but strong arguments resulting in a shift of position.²³ So motivation encourages a more thorough evaluation of the evidence with a genuine commitment to find what seems truest. However, as might be expected, strong arguments are only persuasive if people are given some deliberation time before being forced to give a reaction.²⁴

Evidence suggests that speaking your native language promotes contact with the emotional depths of experience and that speaking only in a second language promotes a dissociation from them:²⁵

Losing your native tongue unmoors you not only from your own early life but from the entire culture that shaped you. You lose access to the books, films, stories, and songs that articulate the values and norms that you've absorbed. You lose the embrace of an entire community or nation for whom your family's odd quirks are not quirks all. You lose your context.²⁶

In an era when a simplified, to some extent denatured, version of English is becoming the lingua franca of all debate, this is troubling. And the disconnexion can be devastating. In those First Nations of British Columbia communities where fewer than half of the members could converse in their indigenous language, young people killed themselves six times more often than in communities where the majority spoke the native language.²⁷ It was remarked that they had lost cultural continuity, and risked losing 'the thread that tethers together their past, present, and future.'²⁸ As I write, such a fate has become a reality for indigenous people of every culture, including those of so-called 'developed nations'.

Julie Sedivy, a Czech-born Canadian, remarks of her father, who deplored his family's espousal of English:

I watched as my father grew more and more frustrated at his powerlessness to pass on to his children the legacy he most longed to leave: a burning religious piety, the nurturing of family ties, pleasure in the music and traditions of his region, and an abiding respect for ancestors.

To have no particular predilections is impossible. The difference is not between those who have such predilections and those who don't, but between those who know they have them and those that are ignorant that they have. And these are the dangerous ones: those that think they lack prejudice.

They exemplify what is called the bias blind spot. Fairly obviously, believing you are less biased makes you more dangerous, because you are less open to advice or to alternative views. And it is widespread. In one study series, only one out of the 661 participants judged himself or herself more biased than the average person.²⁹ Moreover, according to the same series of studies, believing yourself to be unbiased is not related to intelligence (or to education, self-esteem, age, sex or race).³⁰ 'If anything, a larger bias blind spot was associated with higher cognitive ability', conclude Richard West and colleagues, leading researchers in this area.³¹

But prejudices do not *have* to issue in bias. Even an unbiased person will have accumulated past experience, and if, as seems likely, experience does not lead to a conclusion that there simply are no group differences to observe, a pre-judgment is inevitable, and to ignore it entirely is irrational. However, you can and must also take such a pre-judgment into account when making a judgment, so as not to be biased. Prejudices, like reasonings, are only accidentally, not intrinsically, mistaken. As Lee Jussim, Professor and Chair of the Psychology Faculty at Rutgers, points out, if members of motorcycle gangs have higher convictions for acts of violence than do ballet dancers, and men have higher rates than women, we would be simply irrational not to be more concerned by an encounter with male bikers than ballerinas on an ill-lit street at night.³² We are made to feel that such generalised judgments based on knowledge or experience are based on

nothing solid. But they could just as well be called judgments as prejudices.

A common form of objection to any generalisation is to point to examples that contravene it. But on its own this argument has no force: a true generalisation of any kind is fairly obviously not to be dismissed on the grounds that it is not invariably so. Of course it is true that men are taller than women; and of course you can find women – many of them – who are taller than many men. And of course the second does not contradict the first. So it is with all generalisations.

It is itself a prejudice that members of all groups must have the same qualities: even if it were not disproved by experience, the assumption would be irrational. Prejudice against stereotypes, according to some psychologists, is itself an example of prejudice in the face of evidence to the contrary. Examples of silent false assumptions include, according to the sociologist and philosopher Gustav Ichheiser (incidentally a man who knew what malign prejudice could mean: as a Jew, he had had to flee Hitler's Germany): 'people are essentially alike'; 'to think that they are different is prejudice'; 'cultures make no difference to how people think and behave'; 'prejudices, rather than differences, are the main cause of intergroup tensions'; 'stereotypes concerning characteristics of cultural and racial groups must be false'; and 'the layman is prejudiced, but the social scientist is not'.³³ According to a substantial body of evidence, stereotypes are, in fact, surprisingly accurate (see below).

According to Jussim, whose book *Social Perception and Social Reality*, published by OUP in 2012, is the most substantial examination of the area I can find, we assume that, because it has historically produced palpable social wrongs, prejudice must be factually wrong. Looking for the empirical evidence underlying such assumptions revealed that 'there was nothing there, just a black hole ... Stereotypes are almost never perfectly accurate, and they are sometimes highly inaccurate', he says. However,

stereotype accuracy is one of the largest and most replicable findings in social psychology. Over the last 30 years or so, rigorous social science assessments of the accuracy of stereotypes have been steadily rolling in – and, usually (though not always), they show that people's beliefs about groups are pretty (not perfectly) accurate.

Pointing this out has often evoked harsh yet scientifically vacuous responses ...³⁴

In statistics, there is a measure of the strength of a correlation known as the Pearson correlation coefficient (r): the closer r is to 1.0, the more reliable the correlation. To set things in context, an analysis of 25,000 studies, involving 8 million people, across the whole of social psychology research revealed that the most typical r value is 0.21.³⁵ By contrast, the correlations between stereotypes and criteria range from 0.4 to over 0.9, and average almost 0.8 for cultural stereotypes (the correlation of beliefs that are widely shared with criteria).³⁶

Stereotypes of age,³⁷ sex,³⁸ and race³⁹ have all been repeatedly shown to be remarkably reliable, and transferable across cultures.⁴⁰ Corinna Löckenhoff⁴¹ at Cornell has shown, in a paper with 50 authors, that a study of 3,323 individuals across 26 nations, when applied to males and females, demonstrated that the standard survey items captured sex stereotypes in personality over different generations and cultures that correspond to established sex differences: ‘perceptions of actual sex differences may play a more important role than culturally based gender roles and socialization processes.’⁴² Robert McCrae, another leading researcher in the field, writes that ‘consensual stereotypes of personality traits of different age groups and sexes have proven to be remarkably accurate.’⁴³ Interestingly, it seems that stereotypes of male/female differences are accurate but understated (for the curious reader, the first author on each paper here is a woman), whereas stereotypes about political ‘right/left’ differences are accurate but overstated.⁴⁴ Perhaps only our stereotypes of how much other groups engage in stereotyping compared with our own are mistaken.⁴⁵

There is a well-known argument that the reason for objective measures coinciding with prevailing beliefs is what might be called ‘self-fulfilling prophecies’: people conform to expectation. Jussim addresses this at length in the book referred to, and argues, I think convincingly, that this is not generally the case. More of a problem, it seems to me, is knowing how to be sure that the ‘objective’ correlate with which one is comparing is itself truly free from bias. This is a problem for those who wish to claim we are deceived in our prejudices as much as for those who wish to claim we are not. The danger is always of a circular process in which results favouring

one point of view are compared with results that also favour that point of view, and found to be astonishingly concordant. Of course, this problem is generally acknowledged in the design of experiments investigating the validity of prejudice, and often, but perhaps not always adequately, taken into account.

So prejudices are not necessarily wrong. What is wrong is to be biased in any individual case by your prejudice. And crucially and very fortunately – our capacity to avoid prejudicial bias when judging *individual cases* is nothing like as limited as is often suggested. In fact it is remarkably good.

It is not true that we don't compensate for prior beliefs in particular cases, and we may even overcompensate for them. According to a meta-analysis of this issue, carried out by the distinguished social psychologist Ziva Kunda and the philosopher Paul Thagard, when individuating information (information about the individual in question, regardless of stereotype) is clear and relevant, its effects are 'massive', with an r of .71 (making it one of the most robust effects in social science), and stereotype effects tend to be 'weak or non-existent'.⁴⁶ In general, therefore, based on an overview of more than 300 experimental studies and a smaller number of naturalistic studies, stereotypes are found to have only very modest influences on our perception of actual individual cases. Jussim and colleagues report:

Considerable evidence has accumulated that people usually (though not always) apply their stereotypes in a largely rational manner, relying heavily on stereotypes in the absence of clear individuating information, but relying heavily on relevant individuating information when it is available ...⁴⁷

Putting it more technically, the effect of stereotypes is 'one of the smallest in social psychology': 0.1. The effect of individuating information is 'one of the largest': 0.7.⁴⁸ They conclude:

To be sure, evidence of stereotype inaccuracy clearly exists. But it exists amidst a body of literature that also includes abundant evidence of stereotype accuracy. In 2014, when this chapter was written, it is only possible to maintain blunt declarations of

stereotype inaccuracy by cherry-picking studies demonstrating inaccuracy, systematically ignoring studies that demonstrate accuracy, and employing double standards that permit the derogation of accuracy [of] studies that are at least as methodologically sound as inaccuracy studies. Thus, our final recommendation is that researchers simply stop declaring stereotypes, in general, to be inaccurate ...⁴⁹

A report commissioned by Britain's Ministry of Justice from Cheryl Thomas, Professor of Law at University College London, and the author of *Diversity and Fairness in the Jury System*, is of relevance here.⁵⁰ She was invited to address concerns about racial prejudice in juries. In her 2010 report entitled *Are Juries Fair?*, also commissioned by the Ministry of Justice,⁵¹ she found that all-white juries in Britain are not more likely to convict black defendants, or to acquit white defendants accused of racist assaults. In fact, it seems all juries, black or white, are more likely to convict white defendants, and notably, white juries in a racially mixed area were 'significantly more likely to convict the white defendant when he was accused of assaulting a black or minority ethnic victim compared to a white victim'. Thomas also refuted earlier findings – based on a much smaller case sample – about rape cases. She found juries' conviction rate in rape cases to be about 55%, higher than for attempted murder, manslaughter and GBH (grievous bodily harm, the most serious level of physical assault under British law). While accepting that the low proportion of rape allegations resulting in conviction remains a real concern, she suggests that this has little to do with juries' perceived unwillingness to convict.

I wouldn't want to make too much out of all this: there are a number of caveats to enter. Of course we can be blinded by prejudice. Nor does Jussim claim, obviously, that there are no wrong prejudices, nor that there are never adverse consequences to prejudice – just that our view that they are usually wrong is false. He does not claim there will not be individual studies that are discordant with his conclusion, since he is basing conclusions on meta-analytic overviews of the research. Nor does he have anything to say about why it is that differences between groups exist, a quite separate issue, or whether the indicators he is using reflect enduring differences, or just how things stand at a moment in time. But just because we have a prejudice against prejudice is not a good enough reason to ignore the evidence.

We also make judgments of fact very swiftly: are they reliable? Some people object to the natural human capacity to judge character from faces: perhaps inevitably someone has coined the term 'face-ism'.⁵² Such judgments will often be wrong, of course, so whenever one has more to go on one should not simply rely on judgments based on the face (just as one should always seek the widest range of information practically available in making any judgment). However, as has been repeatedly pointed out by scientific experiment, we are quite capable of judging character from the face, even if the effect is not very strong.⁵³ People prefer elements on which they can pass a conscious judgment, such as hair or clothing, but these elements impair the quality of their first 'instantaneous and effortless' judgments based on the face.⁵⁴ Such *Gestalt* judgment is significantly better than chance at exposures of around a tenth of a second (though not at 1/30th of a second).⁵⁵ It is based at least in part on experience; thus accuracy at the task increases 2.5 times between the ages of 13 and 18.⁵⁶ The effect operates equally well in a cross-cultural context.⁵⁷ Female subjects 'may exhibit an evolutionary-based overestimation' of 'defectors', ie, understandably be more cautious in judging someone trustworthy.⁵⁸

We are highly accurate at judging age, sex and race with very brief exposures (around a tenth of a second).⁵⁹ But we are also much better than chance at judging more ambiguous categories, such as sexual orientation (even when subjects make an attempt to disguise it)⁶⁰ and political affiliation. A meta-analysis careful to allow for confounding effects found that 'aggregating across tens of studies and hundreds of effects, people were found to be significantly more accurate than chance in categorizing members of perceptually ambiguous groups'. The total combined effect suggests that approximately 64.5% of targets would be correctly categorised, compared with the expected 50% by chance alone. This yields an *r* of .29, which, as the authors point out, is better than the average for social sciences results.⁶¹

The time course of action of a prejudice is clearly instantaneous, though it may take years to evolve.

As far as hemispheres go, stereotypes are aggregates of experience, and depending on how you look at them, could be associated more with either hemisphere. Their genesis requires pattern recognition and social sensitivity (more typical of the right hemisphere); their application may involve

conclusions that have been jumped to (more typical of the left hemisphere). The left hemisphere plays a more prominent role when targets are considered as examples of generic social categories (eg, men or women, black or white) rather than unique individuals.⁶² People who have difficulty dealing with and being alive to social relations may fail to detect reliable patterns of difference and rely on abstract reasoning to conclude that there therefore are none. However, there is evidence that the right frontal area has a very important role in inhibiting *acting* on prejudice in any one case. The retrieval of conceptual knowledge typically involves the left inferior frontal gyrus; by contrast, dealing with the individual case, and deciding whether this case fits the general concept, depends on the right inferior frontal gyrus. Activity in the right inferior frontal gyrus is seen when subjects are judging whether sex-stereotyped traits apply or not to a series of male and female individuals (as compared with traits that were unrelated to sex stereotypes).⁶³

The right inferior frontal gyrus has, in fact, a role in inhibiting prepotent responses across many domains.⁶⁴ Most findings indicate that activity in the left lateral prefrontal cortex is linked to the implementation of action, whereas activity in the right lateral prefrontal cortex is linked to inhibition of action.⁶⁵ ‘This pattern of lateralised function – stereotype retrieval and implementation on the left and response inhibition on the right – suggests a useful distinction in the processes through which stereotypes are applied in behaviour’, according to neuroscientist David Amodio.⁶⁶

Overall, then, one thing is clear: the left hemisphere is more prone to bias than the right.

Finally, the idea that reason acts as the ‘cleaner-upper’ of the messy, gut-sourced prejudices produced by intuition is itself an illusion. In their seminal paper referred to earlier, entitled ‘Why do humans reason?’, cognitive scientists Hugo Mercier and Dan Sperber argue that while

reasoning is generally seen as a means to improve knowledge and make better decisions ... much evidence shows that reasoning often leads to epistemic distortions and poor decisions ... reasoning pushes people not towards the best decisions but towards decisions that are easier to *justify*.⁶⁷

Reasoning, they suggest, enables people to ‘produce arguments to convince addressees who would not accept what they say on trust’ – one consequence of which must be that in any society large enough that people no longer know one another well it becomes the default mode of discourse. Boxes have to be ticked, algorithms followed. Mercier and Sperber point to the fact that ‘when we reason, we know that we are reasoning, whereas the very existence of intuitive inference was seen as controversial in philosophy before its discovery in cognitive science’; and that ‘the very function of reasoning puts it on display in human communication’. In other words, it is rhetorically more appealing than any alternative – often, I would add, quite rightly, while accepting that if not tempered by intuition, it may lead to poor outcomes. Daniel Kahneman’s highly enjoyable *Thinking, Fast and Slow* brought into the popular realm ingenious work that he and Amos Tversky had been carrying out and publishing for about 40 years, demonstrating errors in reasoning.⁶⁸ In a discussion of Kahneman’s influential positing of system 1 (immediate) and system 2 (deliberative) thinking styles, Mercier and Sperber write:

It is sometimes claimed ... that the meliorative function of system 2 reasoning is achieved by correcting mistakes in system 1 intuitions. However, reasoning itself is a potential source of new mistakes. Moreover, there is considerable evidence that, when reasoning is applied to the conclusions of intuitive inference, it tends to rationalize them rather than to correct them.⁶⁹

We need to regain some middle ground here. Contemporary discourse can be excessively dismissive of intuition and feeling *and* of reasonable argument – hyperrationalistic and overheated at the same time (both characteristic of the left hemisphere). We should never dismiss reason, but then we should never just dismiss intuition, either. We need them to work together, since reason guided by intuition is better than reason that disregards it; and intuition that is not dismissive of reason is better than intuition that is. We need as many ways of getting hold of reality as we can. This is well put by Jonas Salk the discoverer of the polio ‘vaccine’. He suggests precisely the $R \rightarrow L \rightarrow R$ progression whereby the hemispheres work well together:

Reason alone will not serve. Intuition alone can be improved by reason, but reason alone without intuition can easily lead the wrong way. They both are necessary. The way I like to put it is that when I have an intuition about something, I send it over to the reason department. Then after I've checked it out in the reason department, I send it back to the intuition department to make sure that it's still all right.⁷⁰

For Salk, while intuitions should always be passed before the eye of reason, it is intuition that should always be the final judge. Bergson explains why:

... philosophers, in spite of their apparent divergencies, agree in distinguishing two profoundly different ways of knowing a thing. The first implies that we move round the object; the second that we enter into it. The first depends on the point of view at which we are placed and on the symbols by which we express ourselves. The second neither depends on a point of view nor relies on any symbol. The first kind of knowledge may be said to stop at the *relative*; the second, in those cases where it is possible, to attain the *absolute*.⁷¹

Intuition is not just another tool, like analysis: it inhabits, rather than inspects, the matter at hand:

By intuition is meant the kind of *intellectual sympathy* by which one places oneself within an object in order to coincide with what is unique in it and consequently inexpressible. Analysis, on the contrary, is the operation which reduces the object to elements already known, that is, to elements common both to it and other objects. To analyse, therefore, is to express a thing as a function of something other than itself. All analysis is thus a translation, a development into symbols, a representation taken from successive points of view from which we note as many resemblances as possible between the new object which we are studying and others which we believe we know already.⁷²

This distinction becomes of overwhelming importance when we try to approach inexpressible, because *sui generis*, experiences, such as those of time, space, consciousness and the sacred, as we will see in Part III.

FURTHER DECLINE IN THE FORTUNES OF INTUITION

None of the evidence of the importance of intuition has stopped its routine and often casual denigration. It seems that we have constantly to be told how unreliable our intuitions supposedly are – even when the evidence adduced to prove it often tends, on closer inspection, to do nothing of the sort. An important element is that adopting the apparently ‘sceptical’ posture puts the instant ‘expert’ in a one-up position compared with the poor old ‘man on the Clapham omnibus’, who appears naïve. Intuition is also a threat to a world-picture based on administration, adherence to ordained procedures, the power of technology, and a belief in the superiority of abstract mentation over embodied being. And to the reductionist, the power of intuition is also a threat that must be ‘debunked’.

A typical case happens to come to my notice as I write. A piece of research has just shown that confidence in your intuitions is only weakly predictive of whether they are good or not: ‘while confidence in one’s intuitions vis-à-vis a particular task at hand may bear some relation to actual intuition performance, the predictive validity is likely low.’⁷³ Notice two things. First, and relatively trivially, the research doesn’t show that if you think you are good at intuition you are *not*, just that if you don’t think you are, you still may be – if you are confident, you are not necessarily any more correct than someone with lower confidence in their judgment. Second, and much more importantly, it has nothing to say about whether intuitions are themselves valid – only about whether the strength of one’s belief that one’s own intuitions are valid is valid. As it happens, intuitions themselves are more often valid than not, as one of the authors of the paper himself states: ‘overall, actually, our intuitions are quite good.’⁷⁴ Yet how was this research reported on the web (by an author of ‘several health-related books’)? ‘Think your intuition helps you make wiser decisions? Probably not, say researchers ... A recent study from Great Britain suggests that relying on intuition may be yet another delusion we have about ourselves.’⁷⁵ The only deluded person here is the journalist.

Casual knocking of intuition matters more, however, when it appears to undermine faith in the way we make judgments, often with the implication that if only the human element could be removed, we’d all get along much

better. Earlier I described how, from my own experience, intuitive judgment plays a vital role in the practice of medicine, as it does in many other professions; and just how striking it can be. So in reading Kahneman's *Thinking, Fast and Slow*, I was struck by this passage, where he talks about medical expertise, and it gave me pause for thought:

Experienced radiologists who evaluate chest X-rays as 'normal' or 'abnormal' contradict themselves 20% of the time when they see the same picture on several occasions. A study of 101 independent auditors who were asked to evaluate the reliability of internal corporate audits revealed a similar degree of inconsistency. A review of 41 separate studies of the reliability of judgments made by auditors, pathologists, psychologists, organizational managers, and other professionals suggests that this level of inconsistency is typical, even when a case is re-evaluated within a few minutes. Unreliable judgments cannot be valid predictors of anything.⁷⁶

It wasn't the first time I had heard similar points of view expressed, but this struck me as remarkable for two reasons: it was unusually damning, and it didn't tally at all with my experience. Maybe I had been lucky to have had the honour to be trained exclusively by, and to work alongside, some particularly astute clinicians; but the idea that an experienced radiologist assessing a patient's chest X-ray would contradict himself or herself frequently, and sometimes after only a few minutes, was a bit of a surprise. So I decided to read for myself the source material on which this was based, which, of course, Kahneman scrupulously cites: he notes a paper in support of each of the first three sentences of this paragraph.

For the first sentence – 'Experienced radiologists who evaluate chest X-rays as "normal" or "abnormal" contradict themselves 20% of the time when they see the same picture on several occasions' – he cites a 1968 paper by Hoffman, Slovic and Rorer.⁷⁷

I looked it up. To my bemusement, I discovered that the paper had nothing to say about chest X-rays, or even about chests. It was about gastroenterology, and concerned not the interpretation of a single image, or indeed of a 'picture' of any kind. Nor did it concern a decision of 'normal' versus 'abnormal', but the far harder issue of whether in the abstract a

constellation of six factors on radiological examination suggested malignancy or not – not a cut and dried matter, and a question of balancing intrinsically uncertain signs, that are certainly abnormal, but may or may not mean cancer, often depending on the context, which here the ‘experts’ didn’t have. The test was highly artificial: assessing six pieces of ‘yes’ or ‘no’ data on a sheet of paper, as though one made clinical judgments outside the context of a specific patient, rather like solving a quadratic equation. Moreover, the radiologists in question were nine, three of whom were not even fully qualified, never mind experts; and of the other six their degree of experience is not reported – in which case it cannot be presumed that *any* of these clinicians were actually experts, for one very good reason, which James Shanteau explains:

In many studies, self-designation or scores on a short knowledge test are used to select ‘experts’. In other studies, job titles or academic credentials have been used. From the present view, such ‘experts’ in fact are more like novices ... Because of the exalted position of experts within their profession, it can be difficult for researchers to study or even to communicate with them. Experts typically are busy and reluctant to talk – and their time is valuable. In comparison, novices generally are more available and willing to talk – and their time is relatively cheap. It is therefore easier to study novices, but such research won’t answer questions about experts.⁷⁸

The one thing that was correct was that, in these rather different circumstances, the participants, whoever they may have been, were only 80% consistent. A machine of course would not have assessed two sets of criteria differently on two occasions. That, however, is not because a machine is superior, but because it is mindless and inflexible. A human being thinks, and therefore considers a range of possibilities where it may be artificial to suppose that just one of them is right. There may be good reasons to arrive at a range of conclusions, which human thinking better reflects.

I thought I might have better luck with the second paper Kahneman mentions. This is the one on which he bases the remark: ‘A study of 101 independent auditors who were asked to evaluate the reliability of internal corporate audits revealed a similar degree of inconsistency.’ I’m clearly no

expert on accounting, so, like Kahneman (I presume), I have to take what the author of the paper tells me – in this case, Paul R Brown, a distinguished professor of accounting, whose paper was published in 1983.⁷⁹

This concerned 288 questions of judgment – rating ‘satisfactory’, ‘adequate’, etc. More than half of the 101 subjects had between three and seven years’ experience: whether that makes them experts is also a question of judgment. Be that as it may, Brown writes: ‘Judgment stability averaged .79, which *indicated that the auditors were stable in their judgments.*’ In fact, about 80% stable. Or as Kahneman, neatly re-framing, would put it, ‘contradict[ed] themselves 20% of the time.’

Brown notes that, though ‘the current task was complex and not previously studied’, this complexity did not affect the auditors’ abilities to make consistent assessments, ‘which’, he reflects, ‘has been *a general conclusion of auditor judgment studies.*’ The analysis of their consistency in making decisions, he points out, required them always to make the same bald ‘yes’ or ‘no’ judgment on a matter in which such sharply delineated boundaries do not exist. Here, nonetheless, in a difficult area which involves problematic, cut and dried, responses on imprecise matters, they were impressively consistent. They were 100% consistent across all the judgments 80% of the time: if, under these circumstances, they had been more consistent, one might have thought they were accounting machines. Particularly note that this study confirms that it is in line with other auditor judgment studies.

So with some unease, and a growing fascination, I turned to the third of Kahneman’s papers, one by James Shanteau on expertise across a number of fields, and which therefore promised to be the most revealing.⁸⁰ To remind you, this was the ‘review of 41 separate studies of the reliability of judgments made by auditors, pathologists, psychologists, organizational managers, and other professionals [which] suggests that this level of inconsistency is typical, even when a case is re-evaluated within a few minutes.’ Shanteau, whose special area of expertise is experts, and who has studied experts for decades, had at this stage (1988) been looking at the question of expert judgment for the previous 10–15 years. He had originally, he tells us, come to the area with a bias against expertise, but ‘surprisingly’ discovered that the experts he looked at

were observed to be careful, skilled, and knowledgeable decision makers ... Since then, my emphasis has been on investigating factors which lead to competence in experts, as opposed to the previous emphasis on incompetence.

There is no mention of '41 separate studies' of the reliability of judgment, which the naïve reader was entitled to expect. However, there are 46 papers listed. Nine of the papers are critical of experts. 37 are either neutral or supportive of experts. Shanteau makes no reference to 'a few minutes', so that must be an embellishment by Kahneman. However, what he does say is:

Current expert systems typically take much of the communication and confidence away from decision makers. Such systems, in effect, alienate the expert from his/her normal psychological environment. It should not be surprising, therefore, to find that decision makers are unwilling to work with systems which are fundamentally incompatible with their perceived roles as experts. If this analysis is correct, then more attention should be directed to preserving the role of the decision maker in expert systems. That is, *systems should be designed about the needs of the experts, rather than expecting experts to adapt to the needs of the system.*

This is directly relevant to the role of experts today.

Kahneman's last sentence is also worth noting: 'Unreliable judgments cannot be valid predictors of anything.' Well, yes – but that seems a bit like loading the dice. Most expert judgments are not predictions, but assessments or diagnoses. Prediction is another matter, and very difficult – especially about the future, as Niels Bohr is said to have said. We all make projections: it's a necessary part of life. But it's wise not to do it any more than you have to, and to admit your uncertainty. Whitehead was a bit fiercer:

The world's experience of professed seers has on the whole been very unfortunate. In the main, they are a shady lot with a bad reputation ... On the whole, the odds are so heavily against any

particular prophet that, apart from some method of testing, perhaps it is safer to stone them, in some merciful way.⁸¹

Not all, or even many, expert judgments make predictions. Though expert judgments cannot always be correct, they are definitely not so uncertain as to be worthless – even as a basis for prediction, which mainly they do not pretend to be. One reason that experts in economics and politics are so often ridiculed is that their role makes prediction almost inevitable, and it can turn out to be disastrously wrong. It should not be forgotten, however, that their judgment is not in *opposition* to that of computerised algorithms, but, as in the disastrous failure to predict the financial crisis of 2008, reliant on sophisticated theoretical models *operated by* computer algorithms. But then, why have a superstitious reverence for computers? They are only an externalisation of an extreme form of one kind of human thinking, not known for its wisdom, and dependent entirely on the human mind that gave them their instructions. George Soros does better attending to sensations in his back.⁸²

And, if you want an example of successful prediction, the judgment of Franck Mourier is about as non-analytical as it gets, and as typical of the embodied skill of an expert as you could want; the accuracy of his predictions is clearly demonstrated by the very good living he makes from them.

Most expertise, to the extent that it involves prediction at all, is about choosing the right *next* move, not the ultimate outcome. A wise physician can advise on the next step of treatment, but can't tell you when, or of what precisely, you will die. A chess Grandmaster can see the best next move, but not usually how the game will end. A military strategist can see what needs to be done now, but not, with any degree of certainty, what will happen at a later stage – and would consider it foolish to think that you could.

Most tests of expertise are, in the nature of things, highly artificial. One recent study of physicians is typical. It found that 'although expert physicians outperform all other groups [at medical diagnosis], their accuracy is far below the maximum score.'⁸³ Well, there's a surprise – on both counts. And the finding needs to be contextualised. The study involved the diagnostic process relating to four patients' case histories, each containing about a hundred pieces of information, abstracted from notes and

anonymised: any information that was thought to make the diagnosis too easy for an expert was deliberately withheld. It is well known that experienced doctors – in fact, in proportion to their experience – make extensive use of contextual information, such as how the patient looks and comes across (rather like Franck’s intuition about horses), so that a decontextualised case, especially one in which vital information has been withheld, is not a good model of what doctors do.⁸⁴

What’s more, only half the cases lay within any one expert’s field (eight pulmonary physicians and eight cardiologists). One of the findings of the study, which should hardly surprise anyone, was that medical experts construct a representation of a clinical case much more rapidly and more accurately than those who are not experts. Oddly, the authors confess to having no idea why this would be the case.

Meanwhile, the ‘maximum score’ would involve making maximally detailed and accurate diagnoses on all cases, inside and outside your speciality. For example, for a correct diagnosis of carcinoma of the lung you would get only 3/6: to get 6/6 you would have to have ‘small cell lung cancer with metastases in the mediastinal lymph nodes’. Given that cardinal signs of the condition – such as weight loss – were omitted, and given that clinicians approach diagnosis from a view of the whole patient, precisely *not*, as the learner does, from a mass of data, it is surely not a poor outcome that more than 15% of the pulmonary experts and more than 6% of the cardiologists nonetheless achieved a perfect 6/6 in *every* case, within and without their expert area, merely from abstract scripts.

Not only do experts need a lot of experience, so as to have enough patterns to match, and so as to know how much weight to attach to each, they also need to be acting intuitively if they are to display the effects of their expertise. Experts acting intuitively are clearly better than *non*-experts acting intuitively, as might be assumed; but, importantly, they are also clearly better than experts who are making systematic, operationalised judgments – which is how one is forced to proceed in studies of the kind just described, and increasingly in day-to-day practice in the ‘enlightened’ bureaucracy that is Western medicine in the twenty-first century.⁸⁵

That experts don’t know how they do what they do is evident, from the confabulations, and *post hoc* rationalisations, that they proffer when asked – if they can find anything to say at all. When the articulate left hemisphere

knows nothing about what is going on elsewhere in the brain, it makes up plausible theories, which happen to be entirely false.

RULES OF THUMB

Another cause of mistrust in intuition is another of Kahneman's targets: heuristics – effectively, rules of thumb. These are assumptions made on the basis of what usually seems to be the case in similar circumstances, and are not infallible – eg, that when you have a headache it is caused by tension, not a tumour. The majority of the time, like prejudices, they will be accurate, so they are far from useless. Indeed, we couldn't possibly get by without them.

I am also including here what are known as cognitive biases. They are different, in that the rule of thumb, while generally serviceable, works well, but not in every situation; while cognitive biases are always distortions. An example is 'framing' – in other words, the way in which the same information is presented influences how we decide. Thus, a classic case from Kahneman and Tversky goes like this. Subjects are asked to imagine preparing for the outbreak of a disease which is expected to kill 600 people. They are divided into two groups. Each group can choose one of two regimes to combat the disease. One group is told that the options are a regime whereby 200 people will be saved, or one in which there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved. Under these circumstances, 72 % of participants preferred the first regime, only 28% the second. The other group is told that the options are a programme whereby 400 people will die, and one in which there is a 1/3 probability that nobody will die, and a 2/3 probability that 600 people will die. In this situation, 78% preferred the second programme, only 22% opting for the first. The problem is that these choices are effectively the same.⁸⁶

As a psychiatrist, I am only too well aware how many cognitive errors lie in wait for the unwary. Rarely are these actually a matter of 'intuitions', more of fixed ideas or beliefs (a left hemisphere speciality). It seems to me that some sorts of cognitive trap are so widespread and lead to such misery that we should be taught about them in school. I am thinking here of those distortions that the process of cognitive therapy helps to illuminate (and, with luck, almost eliminate), and which are applicable in almost anyone's

thinking: if you think they don't apply to you, congratulations – your bias blind spot is working well. These include:

- *selective abstraction*

dwelling on the small thing that went wrong, not the whole that went well:

'I overcooked the beans, so the whole evening was a failure'

- *arbitrary inference*

jumping to conclusions on no evidence:

'I just know from her tone of voice that she thinks I am fat'

- *minimisation*

inventing grounds to dismiss your successes:

'OK, I got good grades, but that was a fluke – probably someone else's papers'

- *magnification*

exaggerating one's shortcomings:

'I forgot her birthday – what a selfish bastard I am'

- *personalisation*

exaggerating one's part in the responses of others:

(awaiting a reply to a long letter): 'I must have offended him – what did I say?'

- *dichotomous thinking*

taking black and white, all or nothing views:

‘Either it’s perfect, or it’s worthless’.

Usually a moment’s reflection shows how unreasonable they are.

But the sort of cognitive biases that I am writing about in this chapter are less global, less emotional, less a failure to observe the evidence. They are more local, more purely cognitive, more clearly failures of the reasoning process itself. The thrust of *Thinking, Fast and Slow* is that in many situations we make quick and dirty decisions which are inferior to those we would take if we thought more carefully and took our time. Kahneman also points out that we need both approaches, since having a repertoire of more or less automatic responses that tend to work most of the time is necessary for survival, life often presenting us with situations that afford no time for reflection. He therefore constructs a two-system model, ‘system 1’ being quick and dirty (unreliable), and ‘system 2’ slower, more deliberative (reliable).

Thus, for example, you have bought a ticket to a football match. On the day, it is wet and you feel unwell. Getting there requires three changes of public transport and a walk. It would be much more enjoyable to stay at home and watch it on TV. But you don’t: you don waterproofs and go – because, after all, you have paid £75 for the ticket.

But you’ve paid that anyway. You can either have paid £75 and be comfortable, or have paid £75 and be miserable. Apparently the thought of having unnecessarily paid £75, which can’t now be undone, weighs more heavily than anything else, and leads to us making a bad decision. (By the way, we are often swayed by such considerations: that we should not waste is a stronger consideration with some than that we should eat only what we need and want – and indeed it is not entirely irrational.)

Then there are some strictly logical mistakes. One that is interesting for what it reveals about the way we think is the so-called Wason test, one of the most famous in cognitive psychology

(see Plate 16[c]). Most people do not get this right on the first attempt. Try it for yourself before reading on.

The correct answer is: you need to turn over the 8 and the brown card. Whatever is on the other side of the red card doesn’t matter, since the claim is not about what is on the other side of a red card, but what is on the other side of an *even* card. So if the brown card should turn out even, it violates the rule (as would the 8 if it turned out brown).⁸⁷

However, if the test is set in a social context, most people get it right (see Plate 16[d]).⁸⁸ This test has exactly the same logical structure as the earlier one, but is much easier to solve.

Yes, it's the 16 and the beer-mug. It is argued that this is easier because we reason better in circumstances that have human meaning – which is probably why we teach children not just to take two from five, but to imagine Mary having five apples, giving two to Bob, and then seeing how many Mary still has.

There is an interesting rider to this, from a social point of view, which is that when groups attempt the problem in its original form, they do very much better than single subjects. In studies, only 9% of the individuals made the right selection on their own, by contrast with 75% of the groups. And the superior performance of the groups was due to collaboration, rather than to imitation or peer pressure.⁸⁹ This sounds like unexpected good news. As another paper from the same field puts it:

This 'Truth Wins' scenario is in total contrast to what psychologists will normally tell you about group function. In most domains, from creativity to tug-of-war, a phenomenon called 'social loafing' holds, whereby the performance of the group is less than the sum of expected effect of individuals acting alone ... The groups in these experiments have a common goal, and – we must assume – trust each other and are committed to the task. Furthermore the solutions can be demonstrated to be correct. In these circumstances rational argument is productive.⁹⁰

However wrong our quick and dirty assumptions may be occasionally, there may, in general, be more to be said for them than we are allowed to think. Heuristics are highly adaptive and all living creatures employ them in some form. Ant colonies, for example, send out 'scouts' in search of a potential nest – say, a narrow crack in a rock. Such a scout has to estimate whether the area is big enough to house the colony. Not having a tape measure and a slide rule, it does this by using a heuristic. It runs around randomly, leaving pheromone trails of a certain length, then leaves. After a period, it returns, this time moving on a different random path. By noting the frequency with which it encounters the old trail, it can estimate the size

of the cavity. The heuristic is remarkably accurate: in a laboratory experiment, a 'nest' of half the area produced almost exactly twice (1.96 times) as many encounters.⁹¹

It is obvious that heuristics are universal because they are generally on target. They are not, as now seems widely to be believed, the product of a flawed mental system.

Most problems of interest in the real world are intractable to computation. That is why artificial intelligence researchers and engineers often rely on heuristics to make computers smart. However, according to Gigerenzer, who is the Director of the Max Planck Institute for Human Development in Berlin, in the 1960s and '70s the term heuristic acquired a different meaning. No longer regarded as a way to make computers seem smart, it became a way of making people seem dumb. Statistical tools run by computers became the models of cognition, with the consequence that human thinking became viewed as a weak approximation to statistical procedures.⁹² Heuristics were now viewed as preventing one from finding out or discovering correct answers to problems assumed to be in the domain of probability theory – poor substitutes for computations that are too demanding for ordinary minds to carry out.

Although in the literature it was repeatedly emphasised that heuristics are sometimes good and sometimes bad, by an odd coincidence virtually every experiment was designed to show that people violate laws of logic, or probability, or some other standard of rationality. Thus there arose, Gigerenzer continues, widespread misconceptions that heuristics are always second best, that we use heuristics only because of our cognitive limitations, and that more information, more time, and more computation (which computers ought to make possible), would always be better.

In many situations, it's not just that finding the optimal result – assuming, and it is a big assumption, that there is such a thing to find – would be time-consuming. It's that it is intrinsically impossible, either because we do not have, and can never have, enough data, or because the goals defy simple definition. Heuristics are indispensable for good decisions in uncertain situations, which is what life mainly offers. In an uncertain world, good decisions require ignoring part of the available information. The more noise in the observations, the more likely a simple heuristic will outperform more flexible strategies.⁹³ Complex problems do not always require complex solutions.⁹⁴

In a situation where there is low uncertainty, few alternatives to choose between, and a lot of good quality data to go on – sure, adopt a computational model. However, in the considerably more likely circumstances that there is a good deal of uncertainty, there are many alternatives, and relatively few reliable data (small sample sizes relative to the number of factors involved and their possible interdependence), you would be wise to adopt a heuristic. Even ‘one reason’ decision-making can, under certain circumstances, be more effective than analyses that use more information – and those circumstances tend to be common in the world outside the lab.⁹⁵ Sometimes less information and computation can actually lead to higher accuracy.

Note it’s not that, in these situations, we make a trade-off of accuracy against effort. A ‘less is more’ effect holds: the mind would not gain anything from relying on complex strategies, *even if* the costs (including opportunity costs) of such strategies were zero – which, of course, they never can be.

Nonetheless, Gigerenzer developed the concept of the ‘ecologically rational’ heuristic, by which he meant the selection of the right heuristic for the context, so as to make accurate inferences in a ‘fast and frugal’ way. Thus the rationality of a particular decision depends not just on its *internal* logical structure, but on its selection for the *circumstances* in which it takes place. What is considered rational under the ‘rational choice’ account thus might not be considered rational under the ‘ecological rationality’ account, and vice versa. This is reminiscent of, and possibly formed by analogy with the psychologist Egon Brunswik’s idea of ‘ecological validity’, namely that an organism cannot be considered separate from its environment. That environment is always uncertain, and adaptation to an uncertain world requires learning to employ uncertain evidence. As before, precision can be inaccurate.

The attempt to find the optimal result itself leads to errors. Because of this we rely on heuristics not just in routine decisions of little importance, but – and perhaps especially – in those of great significance, such as where to live, whom to marry, and how to invest. It is also a mistake to imagine that clever people don’t use heuristics. Intelligence seems to manifest itself in the choice of heuristic, rather than in abandoning them altogether in favour of some less efficient form of decision-making.⁹⁶

A nice example concerns Harry Markowitz, who received the Nobel Prize in economics for finding the investment strategy that produces maximum return for a specified level of risk, called mean-variance analysis. Its general expression is contained in these formulae:

$$E(R_p) = \sum_i w_i E(R_i)$$

$$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij}$$

However, when he made his own retirement investments, he did not use this strategy. Instead he relied on a traditional rule of thumb known as naïve diversification. This means dividing the investment equally between a small number of funds and hoping for the best. This strategy was first proposed by a fourth-century Rabbi, Issac bar Aha; fund managers not having been invented, the aptly named Rabbi Aha recommended having a third of your wealth in property, a third in merchandise and a third in cash.⁹⁷ Of course, he didn't win a Nobel Prize, but according to some measures his method apparently outflanks every subsequent complex strategy.⁹⁸

It is not always rational to act according to the dictates of logic:

Behavior is often called rational if and only if it follows the laws of logic or probability theory, and psychological research has consequently interpreted judgments that deviate from these laws as reasoning fallacies. From a Darwinian perspective, however, the goal of an organism is not to follow logic, but to pursue objectives in its environment, such as establishing alliances, finding a mate, and protecting offspring. Logic may or may not be of help.⁹⁹

For instance, in any series of Prisoner's Dilemma games, two supposedly 'irrational' players, using the heuristic 'tit for tat', fare better than do two rational players who cannot escape the conclusion that the

logical thing has to be to defect.¹⁰⁰ Tit for tat is a shorthand for the reciprocity that helps cement a stable society. And others, like the ‘recognition heuristic’, help us keep track of complex patterns of information in a continually changing world.

Even cognitive distortions, such as the so-called ‘framing’ effect, are the price we pay for seeing things in context; if we did not, as a rule, we would be much more deluded than we are. If you have to choose a quick route you will take the one that *in all probability* works best, not necessarily the best one on this occasion. You just can’t, usually, have it all ways. Having to reason everything out is as disastrous as never doing so at all: the upshot is that we need to know when to do what. And there isn’t a formula for that.

Our choices rarely follow a calculus, which makes us look more irrational than we are. For example, not jumping in to save a life when you could have is equivalent, on a consequentialist calculus, to killing – even jumping in and ducking someone under till they drowned – since both result in a death that could have been obviated had you acted otherwise; but a person who could not see the difference would surely have to be severely functionally autistic. And presented by a psychologist in a test situation with choices involving risk, an experienced person is more likely to focus narrowly on what is stated as certain, because things that are probabilistic only, or implied only, carry less weight when we are not taking a decision in a situation of trust – a sensible heuristic itself, which applies in the ‘treatment regime’ example mentioned earlier. How we respond depends on a whole raft of incidental factors that are hard to control for. We would expect people to take less risky-sounding options as they get more experience of life, and that is indeed the case:

Mature adults apparently resist taking risks not out of any conscious deliberation or choice, but because they intuitively grasp the gists of risky situations, retrieve appropriate risk-avoidant values, and never proceed down the slippery slope of actually contemplating trade-offs between risks and benefits. ¹⁰¹

This is in part because what is called *qualitative* reasoning – human reasoning, in effect, which takes into account such matters as relevancy of factors, factors that can’t be quantified, elements that are ambiguous, and so

on – increases with age. Very young children are more likely to make decisions based on quantitative properties only. The use of heuristics markedly increases in line with cognitive capacity during child development.¹⁰²

This not to say that we don't make egregious errors through unconscious cognitive biases: they are important to understand. One of the most comical examples is that people given a heavier clipboard to hold papers judged the matter to which the papers referred to be 'weightier' than those who were given a light one.¹⁰³ On the other hand, holding in your hand a document that is supported by more information and in which arguments are more thoroughly explored will usually mean more weight of paper, so it's not *quite* as daft as it seems. And subjects carrying a weight on their backs judge an incline to be steeper than those who are not similarly encumbered¹⁰⁴ – but we naturally interpret circumstances in an embodied way: a hill is an invitation to climb (perhaps especially when we are primed by carrying a backpack), and our bodies sensibly register the effort we are invited to make. Highly artificial circumstances produce highly artificial results.

In a certain test, subjects are invited to read the following display (in which the word 'the' is repeated),

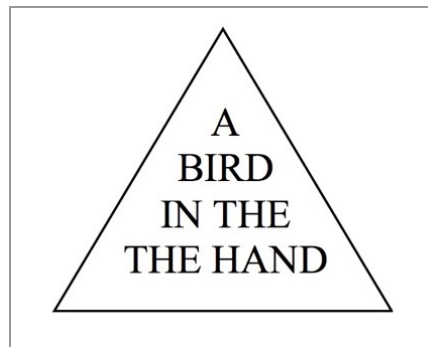


Fig. 36. The effect of expectation on perception

John Kay writes, of those who miss the repetition:

This is a mistake – or so the experimenter thinks. But who is really making the mistake: the pedant who offers the direct answer and reads 'a bird in the the hand'? Or the person with a life, who

approaches the problem obliquely and valiantly finds sense in nonsense?¹⁰⁵

This has its parallel with visual illusions. Visual illusions are in fact short cuts that come with experience, and involve seeing the context. Hence the chequerboard illusion at the outset of this chapter. And appreciation of context comes not from theory but from experience. The left hemisphere does not have it. There is an illusion known as the Ebbinghaus illusion in which context alters our perception (see Plate 16[e]: in children, susceptibility to the Ebbinghaus illusion is rarely present before 6 years old.¹⁰⁶

In schizophrenic subjects, who have many right hemisphere-typical deficits, reduced sensitivity to the illusion is related to an increase in what are called ‘disorganised’ (effectively, bizarre) symptoms;¹⁰⁷ more normal performance (being ‘deceived’ by the illusion) is related to a higher level of *depressive* symptoms – which are associated with the right hemisphere.

And we shouldn’t feel bad about the fact that scents shape our impressions of a person or a situation; millions of years’ worth of information from experience is encoded in scent. That unscrupulous people can use scents to alter our shopping behaviour is hardly different from any other form of deceit. In one study carried out at a clothing store, the scent of vanilla doubled the sales of women’s clothes.¹⁰⁸ And so? Supermarkets use lighting that makes the colours of tired vegetables look more vibrant. We don’t assume *we’re* at fault somehow.

There are many more reasons we behave ‘irrationally’, and they are too numerous, and too well reviewed elsewhere, for me to need to go into them all here. The interested reader will find most of them beautifully covered in Kahneman’s book. But there are two main things to say about them.¹⁰⁹

One I have addressed already: it is easy to run away with the idea that all occasions on which we can be deceived are a proof that we are hopelessly fallible, and our brains are an inferior sort of machine. Those entertaining studies bulk large in social psychology research because this is what social psychologists enjoy studying. It is also, in an era of mass media, what big business, advertising and government propagandists want to know about, for obvious and unwelcome reasons, which makes it a fashionable and lucrative area of research. In reality, while they are assuredly not

insignificant, they are the intermittent downside associated with our being able to do far more than a machine can, or will ever be able to do, until it has blood coursing through its chips. To be wholly rationalistic, and incapable of knowing how to blend logic with all that emotional, social and embodied intelligence tells us, would spell disaster for a human being, as the rare cases where, by some unhappy accident of nature, someone comes even near to such a condition confirm. You will remember Damasio's patient 'Elliot'. But since, unlike logic, such social and emotional intelligence is simply not open to quantification, the downside of it is that at times, inevitably, we appear to 'miscalculate'.

The other is that I am not sure how strong a case can be made for calling such miscalculations 'intuitions', rather than cognitive errors. I have included them here because they are often attributed to intuition. But not reasoning correctly does not, of itself, imply intuition at work. Indeed, it is claimed by some psychologists and philosophers of choice theory that the association between heuristics and intuition is 'unwarranted'.¹¹⁰ Essentially, it is argued, we make almost all decisions in life unconsciously, using a holistic, parallel processing system that is aimed at producing the highest level of consistency between an array of possible elements. Unlike the picture we get when we try to reconstruct after the event what went on, we do not at any point have fixed elements that have to be then weighted, and combined according to 'rational' rules – *whether accurately or fallaciously*. Instead, the system is unconscious, ceaselessly dynamic and recursive, making attempts to recontextualise what information we have so as to make it cohere, and as each element shifts because of its new position in this network, the other elements too must shift however slightly, until a system of optimal integration is achieved.

It has been possible repeatedly to distinguish experimentally between reliance on heuristics, which are sequential and rule-based, and reliance on parallel, holistic but compensatory modes of decision-making, which are taken to characterise the intuitive mode.¹¹¹ And studies have reported that errors resulting from framing effects (as in the disease problem, above) actually increase, rather than decrease (as the traditional view would have predicted) with the requirement to deliberate.¹¹² Another case where less is more.

Evidence suggests that things are likely to be more complex than Kahneman's two-system model suggests. Contrary to his assumption,

reasoning based on beliefs, assumed to be automatic, can, it turns out, be effortful; while reasoning on the logical structure of an argument can be accomplished fairly automatically.¹¹³ ‘Given this analysis’, ask Simon Handley and colleagues, ‘why is it so commonly assumed that belief-based reasoning is automatic and logical reasoning effortful?’ They set out to test this assumption and found that

certain logical inferences are accomplished relatively automatically and are immune to the influence of beliefs. In contrast, judging the believability of a conclusion appears to be a slower process that can be readily interfered with and inhibited by logical analysis. This pattern is exactly the opposite of what would be expected if belief-based judgments were based on fast, automatic, Type 1 processes and logic-based judgments were based on slow, deliberate, Type 2 processes ... At the very least the present findings suggest that it is overly simplistic to associate beliefs with default responses and judgments of logical validity with effortful cognition. The reality is much more complex and suggests a major re-evaluation of dual-process theories of reasoning and judgment is required. ¹¹⁴

In line with a series of recent studies,¹¹⁵ they found that a certain degree of logicity must in fact be achieved through intuitive processing: ‘This result paints a rosier picture than what we could infer from all the investigations of the pitfalls of human rationality ... Our findings present intuitions and logical reasoning not as two competing forces (which usually act in opposition) but as two complementary sources of human rationality.’¹¹⁶ A conclusion with which I would strongly agree.¹¹⁷

The Harvard and Oxford philosopher Hao Wang has something to say on this that both helps bring together the ideas of intuition and analysis, and to some degree exonerates philosophers from the indictment, with which we are familiar, that they already have their conclusions before they start. He holds that they might do so by intuition, but that philosophy is the somewhat blunt instrument with which they *quite rightly and necessarily* have to justify their position, given the world view of their interlocutors – namely, ourselves:

A familiar experience in mathematics is that one is often convinced of the truth of a proposition or something close to it but cannot quite prove it or gets only a defective proof. A good and experienced mathematician seldom errs far in such situations because intuition seems to be *a less exact but more dependable* guide than a formally exact proof, just as the human brain can tolerate more error and indefiniteness than a computer. More generally, we often have perfectly reasonable beliefs but cannot give good reasons for the beliefs ... I agree that we should try hard to see whether our deeply held beliefs can be disproved, especially when we make crucial decisions on the basis of such beliefs. But for me a more fruitful approach to philosophy than systematic doubt would seem to be to search for reasons to support our basic beliefs, which may be somewhat indefinite ... ¹¹⁸

And he goes on to give the example of Kant, whose philosophical development was a 'continued attempt to give a structure to his *Weltanschauung*, which remained pretty much invariant throughout Kant's changes in his doctrines'. He quotes the philosopher LW Beck:

By *Weltanschauung* I mean here: a set of philosophical ideas and opinions held together in a personal attitude, but without the benefit of the technical discipline of analysis and argumentation ... We find a high degree of likeness between conclusions reached in works written [by Kant] over five decades during which profound changes occurred in his premises and modes of argumentation. ¹¹⁹

Before we leave this section, what about the time course and hemisphere contributions?

The typical time course of heuristic thinking is instantaneous, or at any rate brief. That is its advantage. It is largely unreflective and usually involves 'snap' judgments. However, it may take years of experience for the foundations of those judgments to evolve to their established condition. In this it is analogous to prejudice.

In terms of the hemispheres, this is not a clear issue. Kahneman's system 1 and system 2 cut the cake 'horizontally' (top brain versus bottom

brain), whereas I am cutting it ‘vertically’ (left versus right). His systems 1 and 2 don’t map onto left and right hemispheres, but rather slice the brain at right angles to the interhemispheric fissure: both hemispheres are involved in heuristics, and both in deliberation, a point on which Kahneman agrees, though he does not deal with hemispheric differences in his book.¹²⁰ As far as ‘fast’ and ‘slow’ thinking goes, jumping to conclusions (LH) is fast, but so is flawless intuition, as in the case of Franck Mourier (RH); following algorithms is slow (LH), but so, at least relatively speaking, is acting as devil’s advocate (RH).

However, as I have already suggested, it is the left hemisphere that is considerably more prone to settle for its heuristics, the right hemisphere more inclined to be cautious. When urgent, target-oriented action is even contemplated, this activates the left hemisphere. So the left hemisphere is prone both to make swift judgments and to stick to them unreasonably.

And as if to emphasise the point about speed, time pressure impairs the all-important re-balancing activity of the right lateral prefrontal cortex: deliberative rationality – Salk’s third stage – not calculative rationality.¹²¹ So what Kahneman is pointing to seems to be that when we are not given sufficient time for reasoning, we rely on the ‘fast heuristic system’ (the quick and dirty approach, to you and me), which both hemispheres subserve, but the left hemisphere more extensively. If the heuristic is a good fit, which it often is, this is fine; if not, it leads to entrenchment of bias.

THE PERILS OF MISTRUSTING INTUITION

Intuitions are a kind of feeling, we say – which is probably little more than an acknowledgment that they are not examples of explicit thinking. But if they were to partake of the nature of feelings, would that be to discount them? Reason is not opposed to feeling, but dependent on it. ‘There is no such thing in practice as a desire without a belief or a belief without a desire’, writes philosopher Robert Ellis:

We need to start seeing alienated boffins not as ‘unemotional’ but as people with over-abstracted metaphysical beliefs that interfere with their emotional integration. Similarly, an ‘emotional’ person has lots of beliefs which they are reasoning about a good deal: just on the basis of over-narrow assumptions. It is this false dichotomy between rationality and emotion that, I think, more than anything, is responsible for moral failures in the history of Western thought.¹²²

Hume would have agreed. ‘By reason we mean affections’, he wrote, ‘... but such as operate more calmly, and cause no disorder in the temper: which tranquility leads us into a mistake concerning them, and causes us to regard them as conclusions only of our intellectual faculties.’¹²³ As CS Peirce puts it, ‘Man is endowed with a form of emotional rationality; he has the ability to cognize from his disposition to feel; what is valuable seems to be immediately felt and cognized.’¹²⁴ Remember that Peirce was a logician and mathematician. Any dichotomy is too harsh: even the impulse towards a certain kind of logic suggests an emotional reaction to the intersubjective experience of the world, even if the primary emotion is sometimes negative. It is feeling that taught mankind to reason, as Vauvenargues observed during what is often called the Age of Reason.¹²⁵ An irrational fear of emotion leaves us cognitively impaired.

There is a difference between the irrational – something that is defined by its opposition to reason – and that which transcends, reaches beyond, rationality, where rationality no longer can hold sway. This is not to exalt the irrational, but to pay due respect to what one might call the ‘supra-

rational'. In this realm lies intuition, and by one's openness to it no claim is made that it is somehow infallible.

Intuitions can change with time and place, rather as moral codes do: yet neither should be thought of as for that reason random, or as something entirely invented, rather than in part discovered through experience. To both intuitions and moral codes there is a remarkably consistent core over time and place, though much may change 'around the edges'. For the health of any society, one of the most important senses is that of the *reasonable*, one of the best examples of something that is clearly context-dependent, not just in its proper functioning, but in its constitution: a combination of rationality with intuitive understanding. The reasonable is enormously hard to reduce to rules or principles, yet without it we cannot function properly as a society: it is a vital concept in law, and ironically, since the law is often conceived to be about rules and principles, the law may be one of the last places left in which it is evident. But it should be, and largely was, evident in many other areas of life, where systems have now become mechanical, inflexible, black and white, entirely neglectful of context – in other words attuned to the computer, not to the human person. It is a worrying reality that we could lose our intuitive sense of what is reasonable altogether if it gets no reinforcement from day-to-day experience.

Intuitions are laid down in strata, like layers deposited on a river bed, precipitating slowly out of experience, and therefore shaping ongoing experience – but over time they can be washed away. When the water that flows in the river changes sufficiently in its rate of flow, or its composition, the river bed changes. And that water – our experience – is changing rapidly, as I have suggested, because we attend to the world differently; and from different attention comes, inevitably, different experience of the world.

But, like the river bed, intuitions have, as I suggest, layers. And the layers may differ in their nature. Thus it is possible to speak of our 'now intuitive' belief in the mechanistic world-picture, but this is a recent accretion on top of much older intuitions about the world as living, organic, responsive, whole – intuitions that I believe science may be in the process of validating once more.

Speaking of the intuitionist logic of the mathematician and philosopher LEJ Brouwer, Karl Gustafson, a professor of mathematics at Boulder, Colorado, writes:

I would like to ... assert, far beyond just mathematical logic, the same larger, richer value of intuition over formal reasoning as a general proposition in physical science and human affairs ... Just because we cannot codify our intuition does not mean that it does not exist. It may be inconsistent, but it may also be more complete. And as an accumulated underlying partially conscious, partially unconscious, experience and knowledge base, its overall intellectual value far exceeds any single rational deductive process that one may bring to bear on a scientific or human problem.^{[126](#)}

And yet we are intent on a process the aim of which is to banish intuition from all aspects of our lives. In doing so we drastically simplify what we inspect, and cut it off from the roots by which it lives. 'At all levels of society computer-type rationality is winning out', wrote Hubert and Stuart Dreyfus over 30 years ago:

Experts are an endangered species. If we fail to put logic machines in their proper place, as aids to human beings with expert intuition, then we shall end up servants supplying data to our competent machines. Should calculative rationality triumph, no one will notice that something is missing, but now, while we still know what expert judgment is, let us use that expert judgment to preserve it.^{[127](#)}

By now, it may be too late. Some people already seem to believe we are better off in the hands of our new masters, the machines. The fact that machines have been trained to make accurate assessments of, for example, skin lesions does nothing to weaken, but instead strengthens, the case that humans should not be discouraged from using intuition. What these machines have been given is a vast bank of already humanly diagnosed images and made to find measurements that correlate: the advantage of the machine is speed. It carries out a mechanistic procedure, but at prodigious speed. If humans behave mechanistically, they fail: intuition is faster and smarter. A constant insistence on dis-attending to intuitions and placing reliance instead on standard assessment forms and checklists replaces the unmeasurable but often astute assessment of a real human being with the bogus precision and lack of individual flexibility of a machine.

Analytic processes are helpful only when something has gone wrong, or because we are complete beginners. Philosophers and psychologists who have championed the view that our mental processes are akin to those of a computer seem not to notice that we become dependent on analysis only when things are not going smoothly or when someone performing an experiment has given us a task in which we have no prior experience or skill. ¹²⁸

‘To participate in the construction of a model’, according to Dreyfus and Dreyfus,

an expert must regress to seeing the world like an advanced beginner or, in some cases, a novice. If experts fail to appreciate the extent and importance of their unrationalised know-how, they may not realise how seriously their own understanding is being degraded; they may even be flattered into believing that the model constructed on the basis of their answers to the model builder’s questions captures and amplifies their expertise ... The increasingly bureaucratic nature of society is heightening the danger that in the future skill and expertise will be lost through over-reliance on rationality. ¹²⁹

Medical expertise is once again a fruitful example. ‘Doctors are among the most highly skilled of human experts’, the authors continue, ‘and we would expect that they would recognise the intuitive factors in their decision-making: they are, however,

tempted to rationalise their intuitive decisions not only to justify them to themselves and their peers, but also in order to explain them to their patients ... Yet there is a danger of overvaluing explicable forms of knowledge if the patient makes the ultimate decision regarding treatment, based on the facts furnished by the doctor ... In reality, a patient is viewed by the experienced doctor as a unique case and treated on the basis of intuitively perceived similarity with situations previously encountered. That kind of wisdom, unfortunately, cannot be shared and thereby made the basis of a patient’s rational decision ... To confuse the common sense, wisdom

and mature judgment of the expert with today's artificial intelligence, or to value them less highly, would be a genuine stupidity.¹³⁰

There is a complete misunderstanding of what it means to 'know' something nowadays. Thus grand claims are made by clever psychologists that we ordinary folk say we know how something works without 'really' *knowing* it at all.¹³¹ But different kinds of knowledge are here being confused. In relation to everyday matters, we know what we need to know in order to interact with an object. Thus if I say I know how a fridge works (in the sense that I know it is a heat exchanger that creates a cool environment for food), I am not suddenly revealed to be a charlatan just because I can't explain in detail, when asked, how heat exchange is accomplished. It's a matter of the level of appropriate detail. But it's also a matter of embodied versus verbally explicit knowledge. When I say I know how to tie a bow tie, my fingers can accomplish the task easily, but my tongue won't offer a satisfactory account. That is not a 'folksy' failure of the human mind: it is a triumph of the human mind over engagement with unnecessary detail and the proceduralisation of what is not naturally proceduralised. Do I know how I pick up a plate? Of course I do. The fact that I can't any longer give a detailed account of sliding filament theory (a mechanism that enables muscle contraction) doesn't have anything to do with it. This sort of thing knows no end. Is sliding filament theory enough? Or do I need to explain voltage-gated calcium channels in order to 'know'? If so, do I need to be able to distinguish between L-type, P-type, N-type, R-type and T-type calcium channels, in order to count as knowing how I move my arm? This way madness lies.

The historian Jerry Muller, in his devastating critique of contemporary managerial culture, in academia, in medicine and the other professions, *The Tyranny of Metrics*, makes many important points. One is the way in which making things explicitly measurable not only, as is very well known, distorts the practice that is being measured, focussing attention, both for the professional and for the bureaucrat, on what is measurable at the expense of the important elements that are not, but how it narrows our sense of what we are dealing with – confirming the point that an intuitive understanding takes into account far *more*, not less, than the management measures. 'Quantification', writes Muller, 'is seductive, because it organises and

simplifies knowledge. It offers numerical information that allows for easy comparison among people and institutions. But that simplification may lead to distortion, since making things comparable often means that they are stripped of their context, history, and meaning.’ ¹³²

Real life is complex, and when we single out certain aspects for measurement, we inescapably diminish the importance of all the others; and, if they do not become actually invisible, they come to be neglected. Muller notes:

When organisations committed to metrics wake up to this fact, they typically add more performance measures – which creates a cascade of data, data that becomes ever less useful, while gathering it sucks more and more time and resources ... Because belief in its efficacy seems to outlast evidence that it frequently doesn’t work, metric fixation has elements of a cult. Studies that demonstrate its lack of effectiveness are either ignored, or met with the assertion that what is needed is more data and better measurement. Metric fixation, which aspires to imitate science, too often resembles faith.’ ¹³³

Following procedures becomes a substitute for improving practice:

In situations where there are no real feasible solutions to a problem, the gathering and publication of performance data serves as a form of virtue signalling. There is no real progress to show, but the effort demonstrated in gathering and publicising the data satisfies a sense of moral earnestness. In lieu of real progress, the progress of measurement becomes a simulacrum of success ... ¹³⁴

The left hemisphere understands quantity better than quality. Its vision is comparatively simple. It strips elements away from context and history and is ignorant of their real meaning. When it is presented with evidence that what it is doing is not working, its invariable response is first to deny that there is a problem, but, if pushed, to respond *not* that we have done too much of something that is ineffective, but that we simply need to do *more* of it: because that’s what its theory dictates, and for the left hemisphere theory trumps reality.

As I have pointed out elsewhere, the left hemisphere tends to paranoia and control, not understanding the basis of the social phenomenon of trust, and desperate not to be vulnerable.

‘The demand for measured accountability and transparency waxes as trust wanes’, writes Muller. ‘There is an elective affinity between a democratic society with substantial social mobility and greater ethnic heterogeneity, and the culture of measured accountability ... The quest for numerical metrics of accountability is particularly attractive in cultures marked by low social trust.’¹³⁵

And of course its quest to transcend the vulnerability of human assessment and judgment does not succeed. As Gwyn Bevan and Christopher Hood, put it: ‘In the 2000s, governments in the UK, particularly in England, developed a system of governance of public services that combined targets with an element of terror. This has obvious parallels with the Soviet regime, which was initially successful but then collapsed.’¹³⁶ Professionals rely much more on intuition, which is anathema to managerialism. They see the human whole, which the managers don’t; and the more they are made to conform to managerial metrics, the more narrow their vision and practice becomes. Thus is killed the goose that laid the golden egg.

An obsession with counting, and accountability leads, here as elsewhere, to mediocrity. Here as elsewhere, we could learn from the wisdom traditions of the Orient. In Taoism, it is posited that only when the mind is free from pragmatic concerns, free for playfulness in thinking, and spontaneity in action, can there be creativity.¹³⁷ This is referred to as ‘uselessness’ – having no practical purpose in view. Creativity is not willed, and has no purpose. And of course what the left hemisphere particularly values is control and use: we require the right hemisphere to transcend such concerns.

COMMON SENSE

Dreyfus and Dreyfus refer to 'common sense', what is colloquially still known as *nous*. It is the ultimate embodied skill: something in which we all are, or all should be, experts. The existence of an equivalent to common sense exists across cultures, which does not mean that what is believed to be common sense in one culture will necessarily be so in another (although there is much common ground about essentials). Common sense can mean many things, and it is most vulnerable to criticism when it is used in the sense of folk science, eg, that the world is flat because it looks it. All the same it is, once again, not something we can afford to be without. The expression originates in the Latin *sensus communis*: the word 'common' here means something *shared* ('what we have in common'), not just *usual* ('spelling errors are common'). Intuitions evolve in our movement and engagement with the world and with one another, not in detachment and stasis. Common sense is the ultimate embodied skill that is acquired effortlessly through experience, and, to be effective, it needs to be protected from the gaze of analysis.

What on earth can I mean by that? Isn't that *exactly* what common sense needs to be subjected to? Well, obviously, in one sense of the word, yes; but in another sense, and less obviously, definitely not. Of course, I am not suggesting that we should allow common sense to subvert, or replace, science in any way. Science might, in fact – like religion – be *defined* as that part of the mental realm in which common sense does not apply. But it is a tragedy not to have it as a basis for our day-to-day experience of the world and of one another. And excessive analysis there destroys something of enormous value.

Einstein is full of common sense, yet it is he that wrote that common sense was 'the collection of prejudices acquired by age eighteen'. Absolutely correct. No good whatever to science, or for that matter to religion. But important for living a life. And with an almost uncanny accuracy Einstein points to the age of 18. Because it is around this point in life, precisely, that those who are never going to acquire common sense exhibit the fact most tragically. They become seriously ill and risk ending

their lives. Consider what happens in this well-known condition in which, most obviously, common sense is lost: schizophrenia.

Such a loss is perhaps the most invariable accompaniment of schizophrenia, something I touched on in Chapter 9, where I explored the experience of schizophrenia as an analogue of partial right hemisphere failure; in such patients, a return of common sense, like the return of a sense of humour, to some degree, if it can be procured, is a sign of recovery, at least from the acute psychotic phase. It is obvious that a loss of common sense can lead to delusional misinterpretations of experience. But it leads to much, much more than that – to a sort of cutting adrift of the soul from its moorings. What is lost is unreflective engagement with the world, the sense of a shared, unexamined reality. And a loss of the sense of *proportion*, which humour and common sense each imply.

The best exploration of this topic is acknowledged to be by the twentieth-century German psychiatrist and philosopher Wolfgang Blankenburg. In a paper entitled ‘First steps toward a psychopathology of common sense’, he demonstrated just how important to the proper functioning of a human being this lived, intuitive skill that we take for granted can be. ‘Borrowing from Goethe’s well-known formulation’, he writes:

one could say that common sense is an ‘organ’, which is formed in communication for the purpose of communication. It is formed in reciprocal interaction for the sake of this interaction.¹³⁸

Common sense, Blankenburg says, is content with uncertainty, with the probable, as the eighteenth-century philosopher Giambattista Vico had pointed out; whereas science seeks certainty. Schizophrenic subjects require certainty in those areas of life in which it cannot be had – those where, according to Blankenburg, ‘mere opinion (*doxa*) should prevail’;¹³⁹ we saw that one patient thought sex could be reduced to mathematics, another had to carry a dictionary strapped to his back. There is a considerable overlap between the phenomenology of schizophrenia and that of obsessive-compulsive disorder: the love of routine and familiarity, the intolerance of ambiguity, the need for certainty above all.¹⁴⁰ And with modern life, where

absurdity flourishes, while the common sense and a sense of humour that might have checked its advance have been howled down.

As we saw in Chapter 9, schizophrenic subjects replace *phronesis*, an approximate embodied understanding of the world, with *episteme*, a craving for certain abstract knowledge: there is in schizophrenia too great a detachment, an almost ‘scientific’ detachment, from the living world. Most of us live in a world that is semi-transparent, or, as one might say, ‘translucent’, in the sense that the eye rests temporarily on the surface, but does not stay there, instead passing through and beyond to something deeper and broader beneath, the nexus in which it is embedded, which gives it meaning. But in schizophrenia, the plane of focus has changed: the gaze stops short, the surface obtrudes and becomes opaque. Sensing that there must *be* meaning, but not being able to see, however coolly one stares at the object in front of one, what the meaning is, or wherein it lies, one jumps to a conclusion – that it is a hidden sign, a secret mechanism, perhaps something diabolical. Or that it has no meaning whatsoever, in a world composed of similarly senseless fragments. Meaning has slipped its berth and will sail off into space – or land on whatever happens to capture the eye.

Blankenburg quotes a 20 year-old female patient from his clinic in Freiburg:

What is it that I am missing? It is something so small, but strange, it is something so important. It is impossible to live without it. I find that I no longer have footing in the world. I have lost a hold in regard to the simplest, everyday things. It seems that I lack a natural understanding for what is matter of course and obvious to others.

She continues:

Every person knows how to behave, to take a direction, or to think something specific. The person’s taking action, humanity, ability to socialize ... all these involve rules that the person follows. I am not able to recognize what these rules are. I am missing the basics ... It just does not work for me ... Each thing builds on the next ... I don’t know what to call this ... It is not knowledge ... Every child

knows these things! It is the kind of thing you just get naturally ... It is just a matter of mere feeling, sensing what is appropriate. One has this from nature.¹⁴¹

Note a few things here. How vital and irreplaceable this intuitive sense that ‘every child knows’ is; how deep it is (‘I am missing the basics’), and how grievous the loss; how it is nothing so conscious as ‘knowledge’ that is missing; how this has to do with getting on with other human beings in the lived world; how she assumes there must be *rules* she does not recognise (such as the left hemisphere would understand); how everything seems to ‘build on the next’ sequentially, according to the programmatic rules she does not have (as the left hemisphere would have it), not forming a skein or network of multiply interconnected intuitive feelings derived from the context (as the right hemisphere would see it); and yet how she understands that others just have it ‘from nature’, a matter of feeling and *sensing* (such as the right hemisphere would understand, if only she could access it).

As Blankenburg puts it, it must be ‘a tacit possession, as the necessary prerequisite to accomplishing one’s daily tasks’. And the patient continues:

But I am missing something even more fundamental. These people do not even sense the necessity of common sense because they do not lack it. They simply *have* common sense. Then they are able to put two and two together. It is no longer so critical for them. They are able to create a connection with others and enter a realm in which everything functions from itself. Then, one is able to find a way. Then, it is natural and obvious. One is unable to live without it.

The poor patient in despair concludes: ‘Without it, one cannot manage at all!’¹⁴²

This is what it is like to have to examine everything, to find out the ‘rules’, to be conscious of what *must*, if it is to be preserved, remain tacit. Louis Sass calls it a loss of ‘ipseity’, that is to say ‘of-itself-ness’, the quality of grounding itself *in itself* without requiring further grounding. Without it there is no basis for understanding the rest of our reality: without it, one is in the realm of ‘turtles all the way down’.

It is the analogue of Cartesian scepticism. We come back to Merleau-Ponty: ‘the normal, non-pathological attitude consists in having confidence above and beyond what can be proved ... by means of the generosity of the *praxis*, by means of an action that proves itself in being carried out.’¹⁴³ Praxis: the embodied, active engagement with others that does not artificially create meaning, but is the condition *for* understanding the meaning; just as abstraction, detachment and disengagement, taken too far, lead directly to a failure of the means to understand, and ultimately to philosophical nihilism. And note the reference to generosity. When we act intuitively we are gracious and generous – more reflection makes us selfish and greedy.¹⁴⁴

Here let me quote Sri Aurobindo:

If the reason is not the sovereign master of our being nor even intended to be more than an *intermediary or minister* [an emissary], it cannot succeed in giving a perfect law to the other estates of the realm, although it may impose on them a temporary and imperfect order as a passage to a higher perfection. The rational or intellectual man is not the last and highest ideal of manhood, nor would a rational society be the last and highest expression of the possibilities of an aggregate human life, – unless indeed we give to this word, reason, a wider meaning than it now possesses and include in it the combined wisdom of all our powers of knowledge, those which stand below and above the understanding and logical mind as well as this strictly rational part of our nature. The spirit that manifests itself in man and dominates secretly the phases of his development, is greater and profounder than his intellect and drives towards a perfection that cannot be shut in by the arbitrary constructions of the human reason.¹⁴⁵

Eugène Minkowski saw that schizophrenia involved a lack of ‘vital contact with reality’, the pre-reflective attunement to, or immersion in, the world that grounds our being. He defined the vital contact as an ability to ‘resonate with the world’, to empathise with others, to intuit how to respond affectively and to act rightly, through our partaking in an intersubjective world:

Without ever being ever able to formulate it, we know what we have to do; and it is this that makes our activity infinitely supple, infinitely malleable, infinitely human – ‘human’ not in the sense ‘proper to man’ insofar as he is a member of the species animal but in the sense that envisages one of the supreme values, beyond which we would not be able to go.¹⁴⁶

The attempt to substitute rules for tacit knowledge is doomed to failure and a sign of psychopathology. Some reflections of the Dreyfuses on the nature of the law makes it clear why:

The law always strives for completeness but never achieves it. ‘Common law’ helps, for it is based more on precedents than on code. But the sheer number of lawyers in business tells us that it is impossible to banish ambiguity and judgment by specifying a code of law so complete that all situations are specified and prejudged. *Ceteris paribus* [‘other things being equal’] conditions and incompleteness are not merely annoyances showing analysis to be what Edmund Husserl, a philosophical precursor of AI, called an ‘infinite task’. Rather those problems point to something taken for granted: namely, a shared, human background that alone makes possible all rule-like activity. To explain our actions and our rules, we must eventually fall back on our everyday practices and simply say ‘this is what one does’ or ‘that’s what it is to be a human being’. Thus in the last analysis all intelligibility and all intelligent behaviour must hark back to our sense of what we *are*, which is, necessarily, on pain of regress, something we can never explicitly know.¹⁴⁷

Something of the same grounds our moral acts. If someone insists on reasons and rules, there comes a point where one has to say: ‘this is what it means to be a human being’. Virtue ethics, then, not utilitarianism.¹⁴⁸ There are certain things that, if I have to explain them to you, you will never get them at all.

CONCLUSION

Reason's progeny are abstraction, precision and linearity; intuition's progenitors are embodiment, the intrinsically imprecise, and complexity. Intuitions are of different kinds, but they are all subject to being discounted by a culture that relies overmuch on the left hemisphere's take. Once again, the more reliable of them appear to depend on right hemisphere function. They are due a degree of rehabilitation.

In a culture in which computation was not grossly over-prized, an experienced individual would function in almost every aspect of life according to embodied skills, unconscious reasoning, and intuition, with, of course, incursions of analytic thinking, but only when an obstacle was encountered. And the passing on of these skills, through shared experience, attention and imitation, would be the whole purpose of a culture and its traditions. In our culture, all mores have been abandoned; and what should remain implicit and in the realm of embodied skill is foregrounded as a 'problem' to be consciously solved – with the result that we grossly simplify and omit what is beyond calculation. I remind you of Whitehead's insight: 'civilization advances by extending the number of important operations which we can perform without thinking about them.'¹⁴⁹ The implication is clear: when it throws the process into reverse, and impels into the spotlight processes that should be going on in the background, it produces a sort of technically clever, but in reality ignorant, barbarism. Or something that seems very like a species of mental illness.

In Part I, I explored the hemisphere contributions to intuitive insight, making reference to the role played by it in the great discoveries of science and mathematics. In the next chapter I will look at intuitive insight as the most precious means we have to access truth about the world, across the board, itself both grounding and bringing to fruition the important work to be done by science and reason.

INTUITION, IMAGINATION AND THE UNVEILING OF THE WORLD

It cannot be too often repeated: from intuition one can pass on to analysis, but not from analysis to intuition.

—*Henri Bergson*¹

The imagination of nature is far, far greater than the imagination of man.

—*Richard Feynman*²

To the eyes of the man of imagination, nature is imagination itself.

—*William Blake*³

THE PRODUCT OF INTUITION IS INSIGHT. IT HAS BEEN DEFINED AS ‘ANY sudden comprehension, realisation, or problem solution that involves a reorganisation of the elements of a person’s mental representation of a stimulus, situation, or event to yield a non-obvious or non-dominant interpretation.’⁴ But there are other ways of describing where intuition takes us that may seem more in tune with what is actually experienced. We saw that Bergson called intuition ‘the *sympathy* by which one is transported into the interior of an object in order to coincide with what there is unique and consequently inexpressible in it.’ Bergson captures the idea of seeing

into the heart of things that the word ‘insight’ itself suggests, but goes beyond that to point out that what it finds there is inexpressible, an aspect of insight to which we shall return.

Insight is what intuition generates both in the world of everyday (as we saw in the example of Franck Mourier in the chapter before last) and in our attempts to understand, at a more fundamental level, the *nature* of the world. In both cases the insights it produces often surprise us: they can be, as the first definition put it, ‘non-obvious or non-dominant’. You could say they sometimes seem counterintuitive. As an ‘everyday’ example, consider this.

On 5 August 1949 firefighters were called to a canyon fire at Mann Gulch in Montana. The men parachuted in and were deployed on the other side of the canyon from the fire, but as they worked their way downwards, a gust of wind suddenly whipped the fire across to the side where they were stationed. As the fire began to spread rapidly up the hillside toward them, they ran upwards in an attempt to escape. Their team leader, Wag Dodge, however, realising that the fire was moving too fast for them to escape it, had a sudden insight. He lit a fire between himself and the advancing wall of flame, which burnt the ground bare, lay down in the burnt area, and waited for the fire to pass. He was almost the only survivor that day.

His insight was in one sense intuitive, in that it occurred to him in a flash without any conscious deliberation, yet it was also deeply counterintuitive in another sense: to fight fire with fire. It turns out that the Native Americans had discovered this strategy long before him, but Dodge had no knowledge of that fact. Intuition, then, is not conservative in the limiting sense of that word, that we are tied to the familiar. Although, as I discussed earlier, intuition delivers a form of common sense, a background sense of shared (and therefore conventional) understanding, without which neither we nor our society can flourish, it also explores – true to its origins in the right hemisphere – at times new, imaginative ways of looking at the familiar.

But intuition’s power to produce insights that are very far from obvious functions too in our efforts to understand in the most fundamental way the cosmos in which we live. Einstein’s theory of relativity is – or certainly was – deeply counterintuitive. And yet he relied on intuition to guide him there. ‘All great achievements of science must start from intuitive knowledge. I believe in intuition and inspiration’, wrote Einstein:

At times I feel certain I am right while not knowing the reason ... Imagination is more important than knowledge ... It is, strictly speaking, a real factor in scientific research.⁵

There is no mistaking the passion here. And how did Einstein think of intuition? What sort of a thing was he referring to?

He told the violinist Shinichi Suzuki that ‘the theory of relativity occurred to me by intuition, and music is the driving force behind this intuition’.⁶ Indeed, he said to the poet George Viereck ‘I often think in music’;⁷ and his sister Maja reported that when working on a problem he would play the piano, and then get up saying ‘there, now I’ve got it’.⁸ He is said to have told the psychologist Max Wertheimer that he never thought in logical symbols or mathematical equations, but in images, feelings, and musical architecture.⁹ He called mathematics ‘the poetry of logical ideas’, an ‘effort toward logical beauty’ in which ‘spiritual formulas are discovered necessary for the deeper penetration into the laws of nature.’¹⁰

Einstein is making several points here, it seems to me. That for him scientific and mathematical discovery involves intuition is clear; that the intuition uses shapes (‘musical’ or ‘architectural’) as metaphors for ideas; and is led on by a deep attraction towards beauty. The beauty was, certainly, bound up with logic – but not just with logic: it also involved feeling, and a sense of something spiritual.

He said a number of other things that reflect on the process of scientific or mathematical discovery:

the mind can proceed only so far upon what it knows and can prove. There comes a point where the mind takes a leap – call it intuition or what you will – and comes out upon a higher plane of knowledge, but can never prove how it got there. All great discoveries have involved such a leap.¹¹

This discontinuity, the necessity for a leap or sudden shift of thinking, is often mentioned by creative problem-solvers: and on another occasion Einstein wrote: ‘The supreme task of the physicist is to arrive at those universal elementary laws from which the cosmos can be built up by pure deduction. There is no logical path to these laws; only intuition, resting on

sympathetic understanding of experience, can reach them.’¹² This sounds as if it has much in common with the ‘pragmatic’ approach to truth I tried to articulate in an earlier chapter. In both the chapters on creativity and on science’s claims on truth, I have given numerous examples of scientists and mathematicians describing their discoveries as intuitive, every bit as much as those of poets and painters. As Gleiser puts it, ‘to go beyond the known, both Newton and Einstein had to take intellectual risks, making assumptions based on intuition and personal prejudice ... to a greater or lesser extent, every person engaged in the advancement of knowledge does the same.’¹³

Yet clearly maths and science do involve equations, chains of reasoning and verbal explanations. Those, however, must come later, according to Einstein, and are added after the fact: ‘Conventional words or other signs have to be sought for laboriously *only in a secondary stage*’, he wrote, ‘when the mentioned associative play is sufficiently established and can be reproduced at will.’¹⁴ Reaffirming that his thought was ‘visual and motor’, he continued: ‘in a stage when words intervene at all, they are, in my case, purely auditive, but they interfere only in a secondary stage as already mentioned ...’

Einstein did not always listen to his own advice. According to Freeman Dyson,

The great discoveries of Einstein’s earlier years were all based on direct physical intuition. Einstein’s later unified theories failed because they were only sets of equations without physical meaning.

¹⁵

What separates insight from analysis is that it is seen ‘at once’, not arrived at through a chain of distinct steps. By ‘at once’, I don’t mean ‘right away’, because the insight may take a very long time to incubate; it may well involve recasting the problem in a host of different ways over long periods. But, when it ‘hatches’, it is sudden, and it is, by all accounts, utterly convincing. Subliminal priming (cues of which we are unaware) can spark a later insight, after a considerable incubation period.¹⁶ William Wilson Morgan, who discovered the spiral structure of galaxies, did so while walking home one evening from the Yerkes Observatory, in what he

described as a ‘flash inspiration ... a creative intuitional burst’. He substantiated that moment’s insight with data that he presented at a conference a few months later. But that inspiration didn’t come from nowhere. Years of apparently ‘unsuccessful’ effort lay behind it, and were necessary to it. Necessary, mind you – but by no means *sufficient*. Interestingly, it was in the period of relaxation that followed concentrated effort, when the mind is elsewhere, that the insight came.¹⁷

Obviously just because an idea comes suddenly and seems utterly convincing does not mean that it is right. One day, while teaching in Graz, Kepler had an immediate and overwhelmingly convincing insight that the five Platonic solids contained the secret to the orbital paths of the then known planets. He felt ‘as though an oracle had spoken to him from heaven.’¹⁸ Alas, he was wrong.

Hao Wang, who was a pupil of Quine, an authority on Gödel, and Professor of Mathematical Logic and Applied Mathematics at Harvard (he also headed the logic research group at Rockefeller University, New York, for good measure) acknowledged that, of course, intuitive insights can be wrong, but insisted that intuition is indispensable in intellectual endeavour, just as much as in ordinary life:

There is no implication that intuition cannot make mistakes or that it cannot be improved by discipline or by the cooperative effort at advancing human experience. Hence, an appeal to intuition need not exclude, indeed to some extent often depends on, evidence from consensuses and pragmatic consequences ... When faced with an appeal to intuition, the natural response is not to reject it offhandedly on the ground of unclarity, but to ask oneself whether one does share the intuition and how strongly and detachably. In the ultimate sense *we have no absolutely certain knowledge at all, and a careful reliance on intuition is absolutely indispensable in daily life and in all intellectual pursuits*. There is no reason why, and indeed it is curious that, anybody should, only in doing philosophy, choose to dispense with explicit and conscious (public and private) appeals to intuitions.¹⁹

In fact, although intuitive insights are fallible, they may well be less so than other ways of apprehending truth. In a paper entitled 'Insight solutions are correct more often than analytic solutions',²⁰ Carola Salvi and colleagues build on earlier findings by the psychologist Janet Metcalfe. She had asked problem-solvers during a task to rate how 'warm' (close to a solution) they felt. The study threw up two interesting findings. The first was that those who solved analytically described gradually increasing 'warmth' during the task; but those who solved by insight remained 'cold' until the final 10 seconds before the solution (on that '10 seconds', remember that the brain shows signs of a problem having been solved about eight seconds before the insight dawns). And the second was that responses associated with sudden jumps in 'warmth' were correct more often than responses associated with incremental increases in 'warmth'. In other words intuitive solving had a higher success rate than analytic solving.²¹

INSIGHT: SHAPES, METAPHORS AND BEAUTY

Science and mathematics both attest to this intuitive form of understanding – and in the case of mathematics it is clearly the most important form of understanding. It happens not by going through intermediary steps, but by seeing the whole in a new way, and this often means seeing a visual image, certainly an analogy of some kind, similar to metaphorical understanding. So Anna Sfard, herself a mathematician, speaks of the mathematicians she recorded: ‘All the mathematicians I talked to said they just could not think without making pictures. All of them drew different shapes when trying to explain to me certain mathematical theorems or conjectures.’ And she continues:

When the abstract construct is supported by an image schema, the perception of its salient characteristics may become much more like our perception of the properties of physical bodies: it is immediate, it is holistic, and it is not mediated by a long chain of inferences. It is this ability to grasp ideas in a direct quasi-synthetic way, which, according to the mathematicians I talked to, gives them the feeling of ‘true’ understanding.²²

All the mathematicians she spoke to, she reports, talked of an image or metaphor: ‘The role of the metaphor of an object in this process cannot be overestimated’. One, for example, said:

To understand a new concept I must create an appropriate metaphor. A personification. Or a spatial metaphor. A metaphor of structure. Only then can I answer questions, solve problems ... without the metaphor I just can’t do it.

And once we find an answer, we remember what we perceived by insight better than anything we arrived at by more everyday means.²³

It may seem rather odd to non-mathematical readers that mathematicians should even talk about metaphor, let alone think it central

to the processes of mathematical insight. After all, we tend to think of metaphor as a purely linguistic concept, the standard ‘tool of the trade’ for poets and writers. But as I argued, both in *The Master and his Emissary* and in Chapter 15 above, metaphor is far, far more than that. It is fundamental to how we understand the world. It is only by seeing something as in some sense and however dimly ‘like’ something else that we build knowledge, and insight consists in perceiving likeness in dissimilar things. Poetic metaphor – describing one thing in terms usually associated with something quite different – is simply the most familiar use of metaphor and it is, of course, linguistic. But linguistic metaphor is, as it were, only a subset of a much broader mode of human perception which, as the mathematicians attest, includes what might be called non-linguistic metaphor. This broader conception of metaphor is central to insight. In his *De arte poetica*, Aristotle wrote about the role of metaphor and intuitive perception for poets, but he could have been writing about all those whose intuitive insights extend our knowledge of the world. He wrote: ‘the greatest thing by far is to be a master of metaphor. It is the one thing that cannot be learnt from others; it is also a sign of genius, since a good metaphor implies an intuitive perception of the similarity in dissimilars’.²⁴ In short, insight precipitates a new *Gestalt*.

That something of the same process is involved in mathematics and science as in poetry and art – the seeing of similarity within dissimilars – should not surprise us. They are all fundamentally creative processes, involving seeing patterns. As we saw in the testimony of Einstein, ‘seeing patterns’ took for him the form of images, feelings and musical architecture: it was certainly not linguistic and still less analytic: all that came later. To those of us who lack, or who have not been permitted to develop, this intuitive capacity to ‘see patterns’ and ultimately to be rewarded with sudden insight, what actually goes on may seem something of a mystery, as it does to a large extent to those who receive the insights. But they give us some clues. What draws them and what also seems to shape the patterns they see within the dissimilar is a sense of beauty. Mathematics, said Einstein, was an ‘effort toward logical beauty’.

He was not alone in thinking so. Anna Sfard again: ‘The role of aesthetic judgment in mathematical reasoning is a recurrent motif in mathematicians’ accounts of their own thinking.’ One of her subjects said:

Sometimes I make a certain ‘leap of thought’ only because I say to myself that in order for things to be beautiful they must behave in exactly this way and no other. It must be true this way, because otherwise it won’t be beautiful enough. I would even go so far as to say it wouldn’t be ethical if it wasn’t so.

The great French mathematician Jacques Hadamard, had a number of interesting observations to make on the process of invention in physics and mathematics after soliciting the views of over a hundred practitioners. ‘Invention is a choice’, he wrote: and ‘this choice is imperatively governed by the sense of scientific beauty’.²⁵ He later described the sense of beauty as ‘almost the only useful’ drive for mathematical discovery that exists.²⁶

Beauty is a test of correctness that many mathematicians, philosophers and scientists have experienced as a touchstone in their work. GH Hardy, in his *A Mathematician’s Apology*, wrote: ‘Beauty is the first test; there is no permanent place in the world for ugly mathematics.’ Similarly Henri Poincaré wrote that ‘the feeling of mathematical beauty, of the harmony of numbers and forms and of geometric elegance ... is a real aesthetic feeling that all true mathematicians know.’²⁷ According to Bertrand Russell, ‘mathematics, rightly viewed, possesses not only truth, but supreme beauty.’²⁸ Paul Dirac even pronounced, in relation to the discovery by Schrödinger of the wave equation: ‘It is more important to have beauty in one’s equations than to have them fit experiment’. This is because initially Schrödinger’s equation did not fit the data, given the state of knowledge at the time, and he lost heart: but once electron spin was discovered, it fitted the data perfectly. Schrödinger, according to Dirac, got this ‘very beautiful equation ... by pure thought, looking for some beautiful generalization of De Broglie’s ideas ... It seems that if one is working from the point of view of getting beauty in one’s equations, and if one has really a sound insight, one is on a sure line of progress’.²⁹

Again Poincaré sees the essential facts:

It is impossible to study the works of the great mathematicians, or even those of the lesser, without noticing and distinguishing two opposite tendencies, or rather two entirely different kinds of minds. The one sort are above all preoccupied with logic: to read their

works, one is tempted to believe they have advanced only step by step ... the other sort are guided by intuition and at the first stroke make quick but sometimes precarious conquests ...³⁰

Anna Sfard, too, comments that there seem to be two types of mathematicians. What she calls the *operational* types have ‘highly developed manipulative skills and use them as a principal means in their quest after meaning’. By contrast, for *structurally* minded mathematicians, having a metaphor ‘is the dominant need’:

... the manipulative skills, the ability to draw a systematic argument, are sometimes quite secondary ... The structuralists are more capable of direct-grasp understanding than those who think and understand in an operational way. This is probably why the belief that structural thinking is superior to operational was implicit in the opinions of the mathematicians I talked to.³¹

Vadim Krutetsky (or Krutetskii) who made a special study of gifted children, and mathematically gifted children in particular, concluded that the most able students strive ‘for the cleanest, simplest, shortest and thus most “elegant” path to the goal’, whereas average students pay little attention to the aesthetics of their solutions.³²

Even if we did not have the scientific evidence, each aspect of this would suggest a key role for the right hemisphere: its newness, its sensitivity to beauty, its presentation as a form rather than as a statement of any kind, its implicit nature, and its ability to allow something to ‘presence’, not merely to be represented. As Shelley so memorably said of the imagination:

it purges from our inward sight the film of familiarity which obscures from us the wonder of our being. It compels us to feel that which we perceive, and to imagine that which we know. It creates anew the universe, after it has been annihilated in our minds by the recurrence of impressions blunted by reiteration.³³

INSIGHT: LANGUAGE AND SLEEP

In *The Master and his Emissary*, I argued that it is fallacious to suppose that we need language in order to be able to think, and that indeed in some aspects of mental life, language can act as an impediment. Anthropologist Ellen Dissanayake argues that those who belong to pre-modern cultures think in pictures, as well as using direct perception and sensory memory, patterns of smell, light and sound intuitively, in ways that we have lost. Thinking in pictures may, also, be accentuated in some kinds of autism (more commonly, the opposite seems true): Temple Grandin tells us that she thinks in pictures, and when she learnt that others thought with words, could not imagine what that would be like.³⁴ Dissanayake comments:

Perhaps in all of us, thought and memory are more pictorial than verbal ... try an experiment of thinking, say, of a beloved person far away or of remembering an incident from the past. Do words come to mind first? If we are tracking an animal or preparing a meal, do we think in words or do we use some kind of non-verbal spatial and pictorial mentation? ³⁵

When it comes to problem-solving, visual thinking is far more important than verbal: but, for this very reason, during problem-solving visual *perception* can get in the way of visual *imagery*. This may be one of the reasons that we close our eyes when working on a problem: closing the eyes to sight really does increase insight.³⁶ There is an interesting sidelight here. Right hemisphere-damaged patients could easily follow the instruction to 'close your eyes', but if asked to do anything new, their eyes reopened involuntarily:

a reminder that eyes should be closed did not work though the patient was perfectly inclined to follow it: as soon as attention switched to another task, the eyes reopened to the astonishment of the patient.³⁷

And one fascinating study shows that because visual perception does play an important part in problem-solving, higher areas of the visual cortex, involved in re-imagining the perception, need to be disconnected from the lower areas that are simply engaged in presenting the current picture in front of you. We need to see it – but then to see it *differently*. For that, we must no longer be presented with it as it is. The delicate process of re-imagining needs to be protected from potentially interfering perceptions.³⁸ We need to ‘close’ the literal eye in order the better to see with the metaphorical eye.³⁹ This interpretation is consistent with research which shows that there is attenuation of visual input in the right parietal and occipital region immediately before a moment of ‘insight’ while problem-solving: no such effect is noted in pursuing analytic solutions.⁴⁰

Conscious executive processes play little role in insight.⁴¹ Using language brings things to consciousness and makes them explicit: for this reason, we need to get language out of the way for the time being. Having to verbalise impedes visual memory; ⁴² it does so not only for faces, and visual image processing,⁴³ but including things as basic as colour, as well as remembering and identifying tastes and pieces of music, which are obviously not primarily visual at all.⁴⁴ Thinking out loud while solving a problem markedly impairs the ability to find solutions to problems using insight, though it has no effect on analytical problems.⁴⁵

Roger Sperry and his colleague Jerre Levy carried out some problem-solving tests using split-brain patients. Sperry writes that the performance of the left hand (thus the right hemisphere) was

rapid, silent, and direct, whereas that with the right hand was more hesitant and accompanied by a running verbal commentary that was difficult to inhibit ... it was concluded that the disconnected left hemisphere was applying a verbal analytic mode of thinking in contrast to the right hemisphere that had reasoned by direct perceptual, synthetic, or Gestalt, processing.⁴⁶

Elsewhere he elaborates:

The left hand–right hemisphere combination performed about twice as well as did the right hand–left hemisphere ... The thinking

seemed very different depending on whether the subject worked with the left or with the right hand. The performance with the left hand was silent and rapid, while that with the right hand was drawn-out, and accompanied generally by a running, overt vocalisation as the subjects talked and reasoned aloud to themselves, with comments like ‘two lines up, need three dots, spreads to the right’, etc.⁴⁷

Levy noted that linguistic and *Gestalt* thinking appeared to inhibit one another. She reasoned that the need to keep these styles of thinking separate might explain bi-hemispheric structure:

it was as if the speaking hemisphere processed stimulus information in such a way that the stimulus could be described in language. Gestalt appreciation seemed to be actively counteracted by a strong analytic propensity in the language hemisphere. It is therefore not illogical to suppose that during the evolution of the hominids Gestalt perception may have lateralised into the mute hemisphere as a consequence of an antagonism between functions of language and perception.⁴⁸

She then tested IQ in subjects believed to have less lateralised language functions, and found that though their verbal intelligence was unimpaired, their performance (non-verbal) intelligence was dramatically lower (25 points). Language dominated at the expense of *Gestalt* thinking. This is the so-called ‘crowding’ effect by language which I described in Part I.

We also need to get conscious reason out of the way, if we are to make use of insight. One way to do that effectively is, of course, to go to sleep. Research has shown sleep to help produce insight. Individuals trained on insight problems were either allowed to sleep for eight hours before testing or were kept awake for 12 hours. Perhaps unsurprisingly, those that had slept performed twice as well on the insight problems as those who stayed awake.⁴⁹

When it comes, then, to actively solving a problem, rather than just being in touch with one’s gut feelings, it’s not just distraction, or time off, that one needs, but specifically sleep (Franck Mourier described this). In

one study, two groups of subjects were invited to take part in a gambling experiment: the secret to staying ahead of the game was to figure out an underlying rule that was not made explicit. One group got to see the task, then had a full night's sleep, and returned the next day. The other group, after seeing what was involved in the task, got on with their normal daily routine, and came back after 12 hours. Of those who had worked out the rule, twice as many had slept.⁵⁰ And it would appear that it is not just any old sleep, either, but REM (rapid eye movement) sleep, the type of sleep which occurs several times a night, typically in 90-minute bursts, during which one dreams. 'Aha' moments commonly follow REM sleep. It has been suggested by Deirdre Barrett, a psychologist at Harvard who specialises in the study of sleep and dreaming, that sleep has many functions. Sleep, just like waking, she says, is not just for one thing, but for everything. And she proposes that one function of REM sleep is problem-solving. Dreams help us see things anew, so as to see solutions that aren't apparent to our conscious minds.⁵¹

During this phase of sleep, the logical mind retires – in particular, the control normally exerted by the dorsolateral prefrontal cortex is relinquished; the posterior visual cortex is hyperactive; the body and its emotions are engaged. Ideal conditions for trying out intuitive solutions to a problem, as she suggests. And one reason for believing she is likely to be right is something that has puzzled me since medical school: paralysis while dreaming. For this abdication of control by the frontal cortex, which is effectively what happens in dreaming, is all very well, provided the body – its own feelings, memory and intuition engaged – is not going to act on what it intuits immediately, while conscious inhibition is switched off. And, guess what? Nature has thought of that. During REM sleep you are paralysed (as are other mammals, and birds, the only other classes we know from EEG traces to have REM sleep – birds and mammals also happen to be nature's principal problem-solvers).⁵²

There is also some evidence that the right hemisphere is dominant throughout sleep. From the onset of sleep, 'a clear reversal' of left hemisphere dominance can be observed, followed by 'a steady right hemisphere superiority' during both REM and non-REM sleep, as well as at the morning sleep-wake transition. Which may explain why so many good ideas come to us on waking.⁵³

IMAGINATION

Just as the process by which insight comes about seems something of a mystery (as we saw, it seems to be drawn by a sense of beauty), so also there is a degree of mystery about where the imaginative capacity comes from. ‘Poetry, wrote Byron, ‘won’t come when called, – you may as well whistle for a wind ... I have thought over most of my subjects for years before writing a line.’⁵⁴ And thereby he suggests two things: that it is not under control, but that it also does not come out of the blue – years of thought eventuate in the written words: something perhaps most obvious in scientific insights.

The initial stirrings of an insight may be very dim, and provide little indication of where they may lead. Pushkin, at the end of *Yevgeny Onegin*, writes:

Now many, many days have flown,
Since the time when young Tatyana first,
In a misty dream with her Yevgeny
Both dimly appeared in front of me,
And the outspread distance of a story
Through the magic of a crystal ball
I scarcely could discern at all.⁵⁵

Shelley, in his *A Defence of Poetry*, goes further in suggesting not only that poetry cannot be willed but that the poet’s efforts to express the insight weaken its force, that what is immediately if inchoately intuited fades in the process of creation:

Poetry is not like reasoning, a power to be exerted according to the determination of the will. A man cannot say, ‘I will compose poetry’. The greatest poet even cannot say it; for the mind in creation is *as a fading coal*, which some invisible influence, like an inconstant wind, awakens to transitory brightness; this power arises from within ... but *when composition begins, inspiration is already on the decline*, and the most glorious poetry that has ever been

communicated to the world is probably a feeble shadow of the original conceptions of the poet.⁵⁶

The process of articulation, Shelley tells us, already begins the business of direction by the conscious mind, the mind that threatens to wrest the vast, living penumbra of latent meaning into the pedestrian, deadening language of everyday. His remarks are reminiscent of those of William Blake, that honest, wise and completely unsophisticated observer, on the process of creation, that he

cannot previously describe in words what I mean to design, for fear I should evaporate the spirit of my invention ... And tho' I call them mine, I know that they are not mine ...⁵⁷

This is not just a Romantic trope. I suspect that this evanescence is part of the experience of any great artist, and faltering and pondering return us to the pedestrian world of the familiar (which is not to deny that, once contact has been made, we may need to ponder and refine). Thus the seventeenth-century Japanese poet Bashō writes:

Once one's mind achieves a state of concentration and the space between oneself and the object has disappeared, the essential nature of the object can be perceived. Then express it immediately. If one ponders it, it will vanish from the mind ... When you are composing a verse, quickly say what is in your mind; never hesitate a moment. Composition must occur in an instant, like a swordsman leaping at his enemy.⁵⁸

All these testimonies express the conviction of the poets themselves that what they imagine has a life of its own even to the point of them doubting their own authorship. 'It thinks in me', wrote Schelling.⁵⁹ A degree of unknowing appears essential to the creative act. Thus Thackeray wrote: 'I have been surprised at the observations made by some of my characters. It seems as if an occult Power was moving the pen. The personage does or says something, and I ask, how the dickens did he come to think of that?'⁶⁰

Indeed Dickens' own experience was similar: 'some beneficent power shows it all to me, and tempts me to be interested, and I don't invent it – really do not – *but see it*, and write it down'.⁶¹

This something that is seen, not invented, thereby enjoys its own freedom.⁶² It is the artistic generosity that accommodates such freedom that is intrinsic to the genius of Shakespeare.⁶³ And it suggests not something alien to the artist, but something nonetheless distinct within the artist's mind at a level below consciousness, involving both what our senses 'half create, and what perceive' as Wordsworth puts it.⁶⁴

That phrase is of the deepest significance to the argument of this book. It captures the idea that the creative imagination neither 'just' sees nor 'just' creates, but brings the new into existence through the combination of both, so rendering the authorship of what emerges ambiguous. And this is how we bring *all* our world into being: all human reality is an act of co-creation. It's not that we make the world up; we respond more or less adequately to something greater than we are. The world emerges from this dipole. We half perceive, half create.

The philosopher Friedrich Waismann gives one of the best accounts I know of poetic creation – and he thought that philosophical insights were of this kind, too. In fact I would argue that it is one of the best accounts of how the world as a whole comes into being for us:

... a poem, when it comes, comes of itself. One often feels its approach in a curious sort of way as if something from deep down were to rise up and to become a word. Something as yet unknown, faceless, begins to stir, setting up vibrations in the deeper layer of one's being, as it were, and these vibrations pass to the lips in a rhythmic movement. A number of floating words begin to solidify, and as the poet murmurs the verses over he feels a sonnet, or some other poem take shape. So long as this enchanted state lasts, he may get the poem finished; or else the impulse spends itself, the rhythm dies down: the cry is broken. The experience varies a good deal. Some poets find themselves suddenly in the grip of a particular rhythm out of which words gradually precipitate themselves, others have the impression as if some inner voice dictated the poem to them, as if they were eavesdropping rapturously on themselves, spellbound not to miss a single word ... Thus it would not be quite

true to say of a poem that *I* have been writing it, since this would assign too active a part to me, nor that it got itself written *through me* as though it was endowed with a life of its own, nor that it has been written by a mysterious third one who was at work inside me, making use of the mechanism of my body. None of these expressions seems to fit. In order to describe such things more adequately one needs, perhaps, a language in which the boundary between 'I' and 'it' is fluid – of notions, anyhow of terms, that are less definite and held, as it were, in solution.⁶⁵

This notion of a fluid boundary between 'I' and 'it' will be as important to later discussion as Wordsworth's idea that we half perceive and half create the world.

In this process, the detached ego is an impediment. It thinks it can make something happen, when it is best employed in keeping out of the way. Since we don't know what it is the imagination is trying to reach and disclose, our wilful attempts are negative. By contrast negation is positive. Resting in a state of *not* doing and *not* knowing *permits* us to be the agents of revelation. It is not often enough remarked that science establishes what is *not* the case; that we are propelled into philosophy similarly, by the feeling that something widely held to be the case cannot, in reality, be the case. The sculptor achieves the statue not by putting something together, but by discarding what surrounds it so that it is revealed. And this is not just true of creation but of interpretation: good literary critics and good theatre directors know that it is their job not to obtrude in their cleverness between us and the work of art they are supposedly serving, but to efface themselves, along with the accretions that obscure the beauty of the work, which speaks for itself. Clarification works by a process of un-obscuring: as mentioned, the Greek word for truth, *aletheia*, means an un-concealing or dis-covering of what it is that exists.

'What a strange force this intuitive power of negation is!' wrote Henri Bergson:

How is it that the historians of philosophy have not been more greatly struck by it? Is it not obvious that the first step the philosopher takes, when his thought is still faltering and there is nothing definite in his doctrine, is to reject certain things

definitively? Later he will be able to make changes in what he affirms; he will vary only slightly what he denies. And if he varies in his affirmations, it will still be in virtue of the power of negation immanent in intuition or in its image.

The philosopher responds to intuition by a process of ‘complication which provoke[s] more complication’, so as ‘to convey with an increasing approximation the simplicity of his original intuition:

All the complexity of his doctrine, which would go on ad infinitum, is therefore only the incommensurability between his simple intuition and the means at his disposal for expressing it ... You recall how the demon of Socrates proceeded: it checked the philosopher’s will at a given moment and prevented him from acting rather than prescribing what he should do. It seems to me that intuition often behaves in speculative matters like the demon of Socrates in practical life; it is at least in this form that it begins, in this form also that it continues to give the most clear-cut manifestations: it forbids.⁶⁶

Once again, negation initiates creation.

In summary, a great work of art does not itself originate in consciousness at all, though the disposition to receive it may often be preceded by an act of conscious effort or will. It is the fruit of an encounter with a form, often at first indistinct, in a realm outside of consciousness. The artist, by opening himself to it, provides a path through which it can flow, and thereby midwives it into being: it comes out of an unconscious realm, *through* his consciousness, where it is fashioned into being by the artist’s skill.

This something that is brought into being fulfils itself only when another human being encounters it in a similar spirit, opening himself to it, so that something is evoked in him and comes *through* him in response to the work of art. Although communication is central to the experience, it is no more predictable than any other unscripted encounter: it is something new on every occasion. The meaning cannot be fixed and made explicit, but that does not mean it could be just *any* old meaning. Its not being precise is

what allows it to be a true act of creation, rather than merely a repetition or reordering of elements already familiar. In the words of Emerson, ‘The power which resides in [each person] is new in nature, and none but he knows what that is which he can do, nor does he know until he has tried.’ ⁶⁷

IMAGINATION AND THE CO-CREATION OF THE WORLD

For some reason, people feel much happier nowadays talking about creativity than they do talking about the I-word, imagination. This may be because creativity is thought to be dealing with possible realities in a way that imagination is not. There is a story told of a Fellow of Merton College, a mathematician, who was irritated by the attention paid to JRR Tolkien, a Fellow of the same Oxford college, by the fawning guests of other Fellows. One day in the Common Room yet another guest was introduced to the great man, and gushed: ‘Oh, Professor Tolkien, I do so admire your writing, it’s so – so full of imagination!’ The mathematician could bear it no longer, and from behind a newspaper was heard to snort indignantly: ‘Imagination? Imagination?! *Made* it all up.’

From the left hemisphere’s point of view, imagination, like metaphor and myth, is a species of lying: from the right hemisphere’s point of view, it is, like metaphor and myth, *necessary* for access to truth. True human creativity is inseparable from the use of the imagination; I suspect that one of the reasons we found that more creative subjects rely more heavily on the right hemisphere, and less creative ones on the left hemisphere, was that the first group were truly imaginative, while the second were not. And imagination is inextricably bound up with reality, in a way that its bedfellow, fantasy, is not. Fantasy is projected, full-blown, from the workings of our mind. In imagination, rather, we experience intimations of matters that are glimpsed, but only partly seen; our conscious minds obscure them. They resist explicit formulation, because thereby they become something else. This tentative, but rapt, attraction toward something that is not cognised, but at some deep level re-cognised, is not the work of fantasy, but of imagination. Imagination is far from certain, of course; but the biggest mistake we could make would be never to trust it – never to believe in it – for fear of being mistaken. For truth *requires* imagination. It alone can put us in touch with aspects of reality to which our habits of thought have rendered us blind. It leads not to an escape from reality, but a sudden seeing into its depths, so that reality is for the first time truly present, with all its import, whether that occur in the context of what we call science or what we call art.

This sounds like a radical shift in attention (the most fundamental hemispheric difference) whereby what is normally re-presented at last becomes present again. D.H. Lawrence, who, I believe, had great insight into imagination, wrote that ‘the essential quality of poetry is that it makes a new effort of attention, and “discovers” a new world within the known world.’⁶⁸

The distinction between imagination and fantasy is one that was central to the thought and work of the poet and philosopher Coleridge. His is the best expression in English of ideas that were already current in German philosophy for 20–30 years at the time of his writing, and are expressed in the works of Herder, Fichte, Schelling, Hegel and Jean Paul (Richter) in the early nineteenth century. These ideas had seismic repercussions in contemporary philosophical thought and are every bit as striking, and strikingly relevant, today as they were 200 years ago.⁶⁹ Coleridge found crystallised in their writings what he felt to be a deep truth about experience, and egregiously ‘borrowed’ it for himself. It is the central insight encapsulated in his *Biographia Literaria*. What was that truth? That we contribute to the creation of the world we experience, and that we do so in *two fundamentally different ways*.

First, some scene-setting. The nature of everyday perception, although we would not normally call it creative, shares something with the work of the imagination we recognise in the poet or other artist. This may sound odd, but it has to do with the manner in which the experiential world is brought into being for each one of us. That coming into being inevitably depends, even if only in a routine fashion, on what we know, what we already have in memory, and can bring to the process.

I have covered some of this in the Introduction. The whole experiential world is constantly being created afresh. When we ‘perceive’ the world, we are neither passively receiving ‘data’ from the ‘environment’, as a camera or computer would; nor, on the other hand, simply projecting the contents of our mind on a screen.

Our current perceptions are governed by past perceptions and preconceptions; yet these too are always influenced reciprocally, if more weakly, by the new perception, the new experience. Much of what goes on seems to us pretty humdrum, largely the confirmation of our current perception (and conception) of the world. But even that is unbelievably complex and rich, and is born of *embodied interaction*. Clearly what we see

depends on the whole context – where we are, with whom and why we are there, the mood we are in, and so on – and also on what our motivations are: are we searching for something? Bored and filling in time? Hungry? Longing for something? What we see is neither subjective nor objective: the terms are irrelevant relics of a superseded Cartesian way of thinking about experience. There is no such thing as perception without such ramifications, because we are not just creating a Cartesian *representation* of the world, but are involved in the process of the experiential world *coming into being*. One of the besetting sins of our age is the belief that sensory experience is somehow less real than our abstracted mentalisations about it. But, as William James put it:

These percepts, these termini, these sensible things, these mere matters-of-acquaintance, are the only realities we ever directly know, and the whole history of our thought is the history of our substitution of one of them for another, and the reduction of the substitute to the status of a conceptual sign. Contemned though they be by some thinkers, these sensations are the mother-earth, the anchorage, the stable rock, the first and last limits, the *terminus a quo* and the *terminus ad quem* of the mind. To find such sensational termini should be our aim with all our higher thought.⁷⁰

Turning to the current science of perception, according to Luiz Pessoa and colleagues:

perceptual content has to do with the world, not with representations (pictorial or otherwise) in the brain ... at the personal level, there are no pictures, images, or other representations in visual perception; there is simply experience of the world ... vision is not a ‘snapshot’ phenomenon; vision is a temporally extended process of looking constituted through eye-, head-, and whole-body- movements.⁷¹

Neither is this something that involves just one of the senses – say, vision – or just senses at all, unconnected with memory, emotion and imagination. Areas of the brain are not independent modules, but interact reciprocally, using dense forward and backward projections, as well as

hierarchical and parallel strategies, and reciprocal cross-connexions, in an unimaginably complex awareness of the world we experience.⁷²

Even an area such as the primary visual cortex has less to do with external stimuli than with centrally generated hypotheses. A large majority of its input is not from the visual pathway but from areas of the cerebral cortex involved with making sense of ongoing experience, generating expectations and testing them against sensation.⁷³ This confirms, a century on, William James's 'general law of perception ... that whilst part of what we perceive comes through our senses from the object before us, another (and it may be the larger part) always comes ... out of our own head.'⁷⁴ We half perceive, half create; or, as Waismann put it, 'the boundary between 'I' and 'it' is fluid.'

At times, however, we are aware that what we experience is something authentically new that comes into being entirely uniquely in the coming together of our individual consciousness with the world. And although things seem superficially unchanged – by contrast with fantasy, where everything has been bizarrely re-presented – the core is now seen and experienced as quite 'other'. These are moments of uncanniness, awe, inspiration, insight – or perhaps one should say merely *sight*. As we say, visionary.

To return to Coleridge, fantasy, or, as he put it, 'Fancy', is, according to this distinction, something passive (with no life of its own) and mechanical, following known procedures, and dealing with finished entities – a *clothing* of reality, where the core of the reality remains unchanged. It recombines, in novel fashion, what is already familiar, just in a different arrangement or a different dress. Something is added from the outside, that, while altering its object's appearance, does not alter its essence; a 'drapery', as Coleridge puts it, which is just one thing added on top of another, without transforming the whole: it

has no other counters to play with, but fixities and definites ... It must receive all its materials ready made from the law of association.

To use a phrase of Wordsworth's, its product is already 'finished to our hands', laying 'the whole creative powers of man asleep'.⁷⁵ It is a

combinatory faculty, which, Coleridge says, is ‘emancipated from the order of time and space’; and ‘blended with, and modified by ... the will, which we express by the word CHOICE.’⁷⁶

The action of Imagination, by contrast, is seen by Coleridge as the ‘soul’ that is diffused throughout whatever it informs, ‘every where and in each; and forms all into one graceful and intelligent whole’.⁷⁷ It is not added on top of reality, but brings reality into being as it were from within. Its result is not a chain of association, one thing added to the next, but a single seamless process: not a mixture or combination, either, but a compound, in which the parts are no longer separate but integrated into a new whole.

Coleridge made a further distinction which does not at first sight reveal its true significance: that between what he calls primary and secondary Imagination. In fact the distinction is not so much remarkable for separating two elements, as for joining them boldly together. It’s as if I were to say: ‘There is *secondary* music, which is what you hear when you go to a concert, but really that is just a special case of *primary* music, which is what you hear when you listen to the sound of the wind and the rain.’ Not notable, then, for separating two things you thought were one, but for linking two things you had never associated – and, indeed, one of which you most likely had never thought of as music at all.

The force, then, of the distinction he is making is that between, on the one hand, imagination as we generally think of it, the creative force within the poet, in human creativity; and, on the other, imagination as the fundamental creative force in the coming into being of the whole of the world as we know it – and we can know the world *only* as we know it. The latter he calls primary: it reflects its nature in our daily experience of everything, in our perceptions of ourselves and the cosmos, and he takes it to be primary in the sense that it affords our only mode of access to reality. The former he calls secondary, since it is derived from the first, in that human beings are already themselves a part of nature; and therefore our creativity is secondary because it is just part of the fundamental creative force in the whole world:

The primary IMAGINATION I hold to be the living Power and prime Agent of all human Perception, and as a repetition in the finite mind of the eternal act of creation in the infinite I AM. The

secondary I consider as an echo of the former, co-existing with the conscious will, yet still as identical with the primary in the *kind* of its agency, and differing only in *degree*, and in the *mode* of its operation ... It is essentially *vital*, even as all objects (*as objects*) are essentially fixed and dead.⁷⁸

Let us just pause for a moment to take in the features of the distinction between Fancy and Imagination which Coleridge intuited to be so fundamental to the human condition.

Fancy is passive; it sees *objects*, which are fixed, definite, known and 'dead'. Imagination, by contrast, is active, vital, and is already part of what it sees (there is no subject-object divide here). Fancy puts together things already known in a novel way; imagination recreates the known and familiar as something unique and new, by a process of inhabiting, or permeating from the inside – not by combination or addition from the outside. Fancy is subject to conscious choice. Primary Imagination (the mode whereby the world comes into being for us) is not; even secondary Imagination (the work of the human creator) although 'co-existing' with the conscious will, 'yet', as Coleridge is careful to underline, shares the 'kind of its agency' and 'mode of its operation' with the primary imagination, and thus is largely not a matter of conscious control. And, amazingly enough, Coleridge even specifies that Fancy, unlike Imagination, is outside the realm of time and space. I do not wish to labour the obvious: but those of you who have followed me thus far will see that these two aspects of the way our minds work on reality bear an extraordinary resemblance to the modes of operation of the two hemispheres.

Coleridge called Imagination 'the Laboratory, in which Thought elaborates Essence into Existence'.⁷⁹ I understand this to mean that imagination is creative in the most literal sense, since it is the faculty that precipitates into being whatever *is*, and would otherwise only exist *in potentia*. He invented the rather cumbersome term 'esemplastic power' to describe the work of imagination. (In fact he took Schelling's almost equally cumbersome term *Ineinsbildung*, and since, to be fair, it would not work as a single word in English, turned it into Greek before anglicising it: *eis*, in, + *en*, one + *plastikos*, moulding: 'moulding into one'.) What this idea suggests is, according to Coleridge's editors James Engell and Walter Jackson Bate, not just a process of shaping, but 'the organic interpenetration

of parts, and the formative union of shaping and being shaped' (NB: thereby transcending the subject-object divide); and it suggests not only a power that unifies, but one that specifically synthesises opposites.⁸⁰ Hence Coleridge writes:

This power ... reveals itself in the balance or reconciliation of opposite or discordant qualities: of sameness, with difference; of the general, with the concrete; the idea, with the image; the individual, with the representative; the sense of novelty and freshness, with old and familiar objects; a more than usual state of emotion, with more than usual order ...⁸¹

Here are surely, at one level, the oppositions of the tendencies of the two hemispheres: sameness (LH), difference (RH); general (LH), concrete (RH); idea (LH), image (RH); representation (LH), individual (RH); old and familiar (LH), new and fresh (RH); more than usual order (LH), more than usual emotion (RH). The reconciling of these opposites at a 'meta'-level is undertaken by the right hemisphere, as the reader will know, not the left. This is especially striking when taken with Coleridge's description, that we have already encountered, of the difference between Fancy and Imagination.

What he has done here is, first, to draw attention to two dispositions towards the world, that of Fancy and that of Imagination, that have opposing qualities; and, second, to the fact that, at another level, one of these dispositions – that of Imagination – is not frightened by opposites, but has the ability to synthesise *opposites themselves – including these*. Once again this aligns perfectly with what we know of the hemispheres. They yield two distinct takes on reality; but only one of them sees the two takes as complementary parts of a whole. And that is the right hemisphere, the left hemisphere seeing opposites as mutually exclusive.

Shortly before this passage in the *Biographia Literaria*, Coleridge wrote:

In order to obtain adequate notions of any truth, we must intellectually separate its distinguishable parts; and this is the technical *process* of philosophy. But having done so, we must then

restore them in our conceptions to the unity in which they actually co-exist; and this is the *result* of philosophy.⁸²

Analysis should always be a prelude to a synthesis, in which the original synthetic take and the subsequent analytic take are themselves synthesised. The whole purpose of division is to enrich a union. ‘Everything depends’, wrote Hegel, with his customary infelicity, ‘on the unity of differentiatedness and non-differentiatedness, or the identity of identity and non-identity.’⁸³

This coming together of opposites is something I will deal with at greater length in the opening chapter of Part III.

However one looks at it, Coleridge’s description of the creative power of the imagination looks like a very good match for the way in which the right hemisphere approaches and is involved in shaping both the productions of great poets, composers, artists, mathematicians and scientists – and the everyday world. Does that give it a claim to be a more reliable guide than the left hemisphere to what *is*, to whatever we mean by the real, the true? Had he known what we know about hemisphere difference, Coleridge would have had to answer ‘yes’, as would the German philosophers whose world view he shared – and many philosophers both before and since, I suspect, from Heraclitus to Heidegger.

‘Without intellectual intuition, no philosophy!’ wrote Schelling.⁸⁴ I believe these words are important and wise. Wisdom, of which philosophy professes to be the love, cannot exist without the capacity to feel one’s way *into* what one wishes to understand, and to transcend – though by no means abandoning – the merely rational, as well as the merely partisan. But this is certainly not to forsake reason or the need for balance. It’s just that approaching it haughtily from the *outside* as something to be corrected, controlled and subdued is not enough. In Schopenhauer’s words, ‘there is in us something wiser than our head’. This is not irrationalism, but the most successful challenge to it. As Arran Gare writes of Schelling,

The real challenge to irrationalism comes from those who are equally committed to rationality and to doing justice to variety, the particularities of existence and to creativity. Schelling was

exemplary in this regard, and those sharing this commitment are his true heirs.⁸⁵

What is required is a synthesis of both intuition and imagination with reason: the imagined place – though one that is nonetheless with discipline achievable – where each is at its best, standing in equitable relation to each of the others, and informed, where relevant, by science. As Bergson pointed out, if philosophy is not to be merely the further propagation of the analytic tendency in the modern mind, it must mean ‘to reverse the normal direction of the workings of thought.’⁸⁶ In other words, it is to reverse the normal left hemisphere take, under which we approach everything in the hope of discovering its true nature by *analysis*, in order to recapture the right hemisphere take by *synthesis*. And he commented memorably, ‘criticism of an intuitive philosophy is so easy and so certain to be well received that it will always tempt the beginner.’⁸⁷ That’s partly because the applauding audience are already committed to the left hemisphere take – and therefore can’t see that they are missing anything. And partly because an analytic take is so terribly easy to express, whereas an intuitive take is something that some people largely lack, and even where they don’t, is much harder to express in everyday language.

My contention is that imagination, far from deceiving us, is the only means whereby we experience reality: it is the place where our individual creative consciousness meets the creative cosmos as a whole. (It is no coincidence that the same Indo-European root, present in classical Greek, indicates both ‘to know’ and ‘to generate’ or ‘to be born’.)⁸⁸ It is the virtual, re-presented world of the left hemisphere that is the deceit. Imagination is not, as it is sometimes conceived, the capacity to conjure the *unreal*, but, for the first time, to see the *real* – the real that is, for reasons of deeply ingrained habit, no longer present to us. It is not a means of placing something else between us and the world, but of removing the accretions that prevent us from that world’s fuller realisation. To see is not just to register sense-data, but to see ‘into’ the life of what is seen; and ‘through’ it to the greater picture that lies beyond it, is implicit in it, and makes sense of it in terms of the totality of experience. This might seem rather rarefied, but it is what Nobel Prize winner Barbara McClintock, amongst other things an expert in plant morphology, meant when she told her students that ‘first you

must learn to see.’⁸⁹ Goethe repeatedly said the same – generally using plant morphology, as it happens, as an illustration of what he meant.

CONCLUSION

A just sense of how little we understand, and of how we can best approach what lies beyond our current understanding so as not to destroy it in the discovering, is an essential foundation for every great human enterprise. Here the reflections of the biochemist Erwin Chargaff cannot be bettered. Scientist that he was, he realised that if we lose the sense of just how much we do not know, we lose understanding of even the little that we *do* know. He called this sense of fruitful potential ‘darkness’, because it is where we have not reduced the heavens around us to the deceptive clarities disclosed by a flashlight. As a young man he wrote

One could say, the great biologists work in the very light of darkness. We have been deprived of this fertile night ...

He felt that our great scientific and technological exploits had ‘diminished irreversibly’ the points of contact between humanity and reality, but anticipated being misunderstood for saying so. And indeed he was:

Somebody who had read these words said to me: ‘You seem to appreciate the natural sciences only as long as they are not successful. Darkness illuminated becomes light.’ I could only answer: ‘What is success in science? Illuminated darkness is not light. We find ourselves in the cavern of limitless possibilities. Take a flashlight with you, and you may find you are only in a lumber room. If I know what I shall find, I do not want to find it. Uncertainty is the salt of life.’ And he said: ‘When you say darkness, you mean obscurity’. This I denied; but I do not think we achieved conciliation.⁹⁰

The essential point is that every disclosure is also a concealment. Every closing down of potential into an actuality – itself a necessary, even fruitful step – is *by the same token* a limiting of reality to what has been selected. If

it had not been selected, one might have discovered something immensely larger within that field of potential – now forever narrowed to what it is we think we clearly know. Remaining with the ‘fertile night’ means not closing down too soon, too readily, on something that looks familiar – the lumber room that shows up by the light of the torch immediately round us – but instead allowing our eyes gradually to become adapted to the dark so that we see the starlit mantle of the heavens immeasurably further beyond. That, not the lumber room, is where science is destined to take us; revealing, if it is successful, not mere clarity, but ever deeper mystery.

I quoted earlier the logician Waismann’s saying ‘for my part, I’ve always suspected that clarity is the last refuge of those who have nothing to say’. His insight had been anticipated by Coleridge, who praised ‘the elder Languages’ as being ‘fitter for Poetry’, because of the tact with which ‘they expressed only prominent ideas with clearness, others but darkly’. He contrasts this with French, in which he felt that all was forced into a sterile clarity. And he asks ‘whether or no the too great definiteness of Terms in any language may not consume too much of the vital & idea-creating force in distinct, clear, full made Images & so prevent originality – *original* thought as distinguished from positive thought’.⁹¹

Every insight into the depths of reality *requires* imagination. It is not an optional extra, still less an impediment. We must not be blinded by our limited words and concepts to what imagination alone has the power to reveal – though it can only do so to those who are actively receptive of it. Chargaff went on to try to explain his younger self, referring to the most famous image of creation in the history of the West:

What I had at that time – and it has never left me – was a dream of a reality that we could only touch tangentially, an awe of the numinous of nature whose power rested in its very unattainability. It was a feeling for the necessity of darkness in the life of man. In the Sistine chapel, where Michelangelo depicts the creation of man, God’s finger and that of Adam are separated by a short space. That distance I called eternity; and there, I felt, I was sent to travel.⁹²

That short space signals the infinite realm in which the life-giving imagination of our intellect leads us onwards.

What, then, can the testimony of poets, composers, painters, mathematicians and scientists tell us about the business of creation? That a new, intrinsically beautiful, form, just as much in maths or physics as in the arts, is sensed intuitively. That it is not seen precisely at first, and that the dragging of it into the realm of precision too early in order to work on it, brings the danger of its loss. That it takes back something from the realm of the worn and familiar, the wonder of which has been lost, and makes it live. Imagination is literally creative: it brings everything we can know into being for us – and it is only as it is for us that we can know anything at all. To quote Richard Feynman: ‘Our imagination is stretched to the utmost, not, as in fiction, to imagine things which are not really there, but just to comprehend those things which *are* there.’⁹³ Imagination is the path whereby our eyes are opened so that we see something, for the first time, as it really *is* – at least as close to what is as we can ever know.

CODA TO PART II

The problem of how our experience relates to reality is one of the most fundamental and long-standing questions in all philosophy. But it develops a particularly keen edge if it turns out that the hemispheres deliver different versions of the world. Could this in part explain some of the paradoxes that philosophy repeatedly encounters?

Should we accept both versions or only one? If, as I believe, we have to accept that both disclose an aspect of reality, should we give them equal weight? Is their relationship symmetrical, or does one disclose the world more richly, more deeply than the other? These questions are ones to which I gave some preliminary consideration at the outset of Part II. I suggested that we should expect that the disposition of each hemisphere towards the world would affect its very idea of truth; and put forward some evidence that each hemisphere does indeed see truth differently. I also indicated why the left hemisphere's version of truth was likely to be a less trustworthy guide than that of the right hemisphere.

The other big question is not so much about which hemisphere we are better to rely on, but which route of enquiry we should use. This has been the focus of the rest of Part II. Should we trust only science, as some people seem to believe? Or only reason, as others might insist? Or only, ultimately, what accords with our intuition, as still others would say? I think we would have to conclude that no one of them can, on its own, be relied on, because of limitations in the scope, kind and degree of knowledge each is capable of offering; but that each has something valuable to contribute, and cannot safely be neglected – that is the point that seems so clear, and yet so hard

for some people to accept. For them, one path has to win at the expense of the others. Such a conveniently simple solution is not, however, open to us.

In the process, I suggested that we should reject the common, simplistic idea that science and reason are the domain of the left hemisphere and intuition that of the right hemisphere. Instead we saw that each hemisphere contributes to each of them, but in a consistently different way, and to different degrees depending on what is meant by each term. In the case of science and reason, a distinction can be made between an internally consistent, self-directed, already fixed *procedural mode* – prepared to sacrifice truth in the pursuit of consistency, an approach I identified with the left hemisphere; and an outwards turned, receptive, open *process* – prepared to sacrifice consistency, where absolutely necessary, in the pursuit of truth, an approach I identified with the right.¹

It was then that we came to consider imagination, which plays a special role in the argument of this book. There we were looking at something on a higher level – or a deeper level – but at any rate not on the same level: not a methodology or a pathway to knowledge, but the gateway to an understanding; something on which science just as much as art, reason just as much as intuition, depends, if any of them is to make real progress. In short it is foundational to all other approaches.

In Part III, I will attempt to address the question what is truth the truth ‘of’? How can we get some idea of what the stuff of reality is like, and how it is formed? Again I will be seeking to disclose what the lens of the hemisphere hypothesis can tell us. In particular I will suggest that the stuff of reality looks different when we break out of the cultural habit of subordinating what the right hemisphere knows to the take of the left hemisphere in addressing these almost – but not wholly – imponderable questions.

Donne believed that truth could not be approached in a linear fashion by direct assault, but only by climbing one’s way up a rugged path which circles as it approaches its goal, for

... on a huge hill,
Cragged, and steep, Truth stands, and hee that will
Reach her, about must, and about must goe ...²

In the arduous climb towards Donne's crags, we are rewarded with different, but coherent, views of Truth as they come to be disclosed from different angles. From the day I first read those words 50 years ago, I have been continuously mindful of the wisdom contained in the image. Although having widely different methodologies, I believe that neurology, philosophy and physics each help us get closer to an understanding of the reality we experience, providing three confluent paths, circling the same reality, and disclosing different aspects of it, at different times, leading to an account that, *at last*, is true to experience, to science and to philosophy: an account that is nonetheless wholly unforeseen from within the standard reductionist model in which we are now invited to 'live'. It is on this climb that I invite the reader to accompany me in Part III.

APPENDIX 1

HEMISPHERE DIFFERENCES AND CREATIVITY: AN EXAMINATION OF DIETRICH AND KANSO'S EVIDENCE

This evidence should not be read in isolation from its context in the overall argument of Chapter 8.

Before we start, a few caveats. It isn't enough, in order to discredit the idea of the predominant role of the right hemisphere in creativity, just to show that both hemispheres are involved, for a number of reasons.

Firstly, and most obviously, if you are waiting for a situation in which you find only one hemisphere to be active, you will wait forever. The criterion is wholly unrealistic. The issue is whether the right hemisphere plays the crucial role, not the only role. The overall evidence suggests that the right hemisphere is essential to the process of creativity; the left hemisphere, though it may play a part at some point, is of secondary importance, when it does not actually impede creativity.

Secondly, the mode of investigation makes a significant difference. Thus, an investigation relying on event-related potentials (ERPs) in the brain is a particularly poor guide to localisation.¹ Experienced electrophysiologist Geoffrey Woodman writes: 'ERPs have excellent temporal resolution but poor to unknown spatial precision ... It is unknown whether the relevant activity we are measuring is generated near the electrode or across the entire cortical sheet'.² Clearly this can lead to a real, significant localising effect being masked by false negative or insignificant findings.

Thirdly, the task matters: as we will see, tasks that are minimally creative often engage left hemisphere regions, while highly creative tasks show a strong tendency to engage right hemisphere regions.

Fourthly, the nature of the participant matters: evidence I will come to shortly suggests that more highly creative individuals rely on the right

hemisphere to a considerably greater extent than less creative individuals.

Fifthly, many of the studies on creativity are wholly or partly linguistic in nature, involving reading, speaking or generating words – or all three. Even where trouble is taken to avoid an expressly linguistic task, and very often it is not, the inner experience of the subject usually has to be verbalised in order to be taken into account by the experimenter at all. It is only to be expected that any such task will involve the left hemisphere, even if the task is no more creative than reading a till receipt.

And finally, we are not engaged in an exercise of totting-up papers that do and don't support a position, and claiming to make a decision on that basis. Although that would indeed definitely count in the right hemisphere's favour, it is fallacious. Many studies, but not all, point to localisable areas; however, they do keep on pointing to them. Let me put it this way. If I am overseeing the investigation of the 500 murders recorded in Britain last year, I will naturally be interested in their distribution. If I find they are fairly randomly scattered over the country, once population density is taken into account, but that there is an area round a small village in rural Wales where there have been 47, I will not say 'well, there's no need to pay any attention to that, because the other 453 count against there being anything to worry about there'. Finding a murder that is not in this tiny area of Wales doesn't count against the extraordinary fact that they keep happening *right there*. And, a further, related but distinct, point: absence of evidence is not evidence of absence. Particularly when you are dealing with something as fickle and variable as the human brain, and as multifarious and complex as the processes involved in creativity, to find consistent, rather than invariable, evidence that, for example, the right superior temporal region is involved in the moment of creative illumination is something remarkable. No other single area has a similar murder rate.

As an example of the last of these, Dietrich and Kanso (2010) are keen to discount the large body of evidence that we looked at in Chapter 8 suggesting the crucial role for the right hemisphere, and more specifically the right superior temporal region, in creativity. In pursuit of this goal, they say that 'although there are several studies that point to a special role of the right superior temporal gyrus for insight events ... there are more studies that do not support this contention.' There is, needless to say, a difference between not supporting a finding and contradicting a finding. Dietrich and Kanso point here to seven papers.³ None of these papers contradicts the

finding, and indeed one offers support. Only the first two of these are standard EEG studies, potentially providing reliable localisation; the other seven are event-related potential (ERP) studies that do not. That being said, what do these studies, singled out for our attention by Dietrich and Kanso, show? The first (Dan'ko *et al*) reveals 'the EEG spatial synchronization in the majority of frequency bands increases over the right temporal areas and decreases greatly over the prefrontal and frontal areas, predominantly in the midline and left-hemispheric areas'. The second (Kounios *et al*) investigated not the moment of insight, but the phase of preparation (as did the last two papers, both by Qiu *et al*), which is expected to involve quite different networks from those involved in incubation and illumination. All the other papers are ERP papers, with all that that means for unreliable localisation; and either did not look at the moment of insight, but at the preparation phase; or did not separate the data in terms of lateralisation (Lang *et al* and Mai *et al*); or showed that more analytic solving, as expected, involved more frontal and left-lateralised activity by comparison with insight (Lavric *et al*).

I could adduce a large body of evidence that suggests Dietrich and Kanso are misguided. But rather than rely on data that I can adduce, let me look at the full data Dietrich and Kanso adduce to support their position. Inclusion in their study was inevitably subjective (that is by no means intended as a criticism), because they had to whittle down 1,910 papers that resulted from a literature search, and they did so, reasonably enough, by looking at titles and abstracts. They excluded

brain studies reporting on domains that are manifestly relevant to creative thinking, such as metaphorical reasoning, mental imagery, perceptual restructuring, the perception of music, or various processes involved in cognitive flexibility—set-shifting, planning, inhibition of existing knowledge, counterfactual thinking, or perseverance ... unless there was specific mention in the title or abstract of the keywords *creativity*, *creative thinking*, *hypothesis generation*, *aha effect*, *Eureka experience*, *novel ideas*, *original ideas*, *innovation*, *insight problem-solving*, or *insight*.

Fair enough; though practically every one of these 'manifestly relevant areas' would undoubtedly have provided significant evidence of crucial

right hemisphere involvement, as we know. And so would inclusion of studies of brain abnormalities, such as stroke or tumour, which were also explicitly excluded by Dietrich and Kanso: a major omission, but one they were, again, clearly entitled to make – they are the architects of their own study – though in my view it weakens their case.

Not all 63 papers that are finally selected deal with laterality, which is only one, albeit a principal, focus of the zeal for demolition in their review. On laterality, however, they cite 37 studies: 23 electrophysiological (essentially EEG-based, including ERP) studies and 14 functional neuroimaging studies.

Let's turn, as they do, to the EEG/ERP group first. Of these 23, I tracked down and read all but one, the proceedings of a symposium in Novosibirsk in 2005.⁴

I found that eight had nothing to say about laterality, either because the study did not investigate it, or because, more rarely, no conclusions could be drawn.⁵ One study clearly leant towards the left hemisphere, though it found that 'the right hemisphere seems to engage in weakly and diffusely activating meanings and a retrieval of unusual interpretations of words during the Remote Associates Test [a verbal test of divergent thinking]'.⁶ The right hemisphere's greater capacity to find remote associations is a very well-validated finding.⁷

That leaves 13 papers, selected by Dietrich and Kanso, from which I give relevant extracts. Each paragraph is from a separate study:

1. '...the data obtained in this study point to the particular role of **right**-hemispheric cortices in creative thinking. This is consistent with literature which suggests that the **right** hemisphere is involved in a broad range of creative thinking tasks'.⁸
2. 'The common effect was a greater activity of the **right** hemisphere, which did not depend on the sex, task type, or instructions for performance of the tasks ... This was consistent with data in literature evidencing the dominance of the **right** hemisphere'.⁹
3. '... divergent thinking was generally accompanied by increases in alpha power ... most prominent in posterior cortices of the **right** hemisphere'.¹⁰

4. '...the general trend was that HIQ [highly intelligent] individuals in comparison with AIQ [averagely intelligent] displayed higher co-operation between brain sites mainly located in the **right** hemisphere, showing rather short distance co-operation between brain areas in the **right** frontal, temporal and central sites ... In the **right** frontal site, an additional interaction effect between the factors, creativity and intelligence, was observed'.¹¹
5. '...the correlations for intelligence scores were positive and mostly distributed over the **right** hemisphere ... in keeping with studies relating intelligence and creativity with **right** hemisphere functioning.'¹²
6. '... good performance is related to ... increased functional connectivity of central-parietal areas of both hemispheres, and greater ipsilateral connections between the cortex regions of the **right** hemisphere'.¹³
7. '... during improvisation dance, professional dancers exhibited more **right**-hemispheric alpha synchronisation than the group of novices did ... novice dancers display a comparatively low level of alpha synchronization which is somewhat more pronounced in the **right** than in the left hemisphere ... professional dancers, in contrast, exhibit comparatively strong alpha synchronisation in posterior brain regions, especially in the **right** hemisphere'.¹⁴
8. '... we predicted that highly creative people should exhibit greater **right** hemisphere than left hemisphere EEG activity during creative performance and that this pattern would not be found in less creative people. All three experiments supported this prediction. This difference in asymmetry was specific to creative performance. It was not present during basal recordings or during a non-creative task ... highly creative subjects exhibited more **right** than left hemisphere activation; those of medium creativity showed strong asymmetry in the opposite direction; and very uncreative subjects showed about equal activation in both hemispheres ... Creative [subjects] tend to show high levels of **right** hemisphere activity (as compared to left hemisphere activity) during creative production'.¹⁵
9. '... the total divergent-thinking-induced effect of more co-operation between cortex areas in the **right** hemisphere indicates a

- substantial contribution of the right hemisphere in creative thinking'.¹⁶ [The authors found that in overall analyses, the right-hemispheric coherence increased in highly creative individuals, but decreased in averagely creative individuals, compared to baseline.]
10. '... analyses revealed that more, as compared with less, original ideas elicited a stronger event-related synchronisation of alpha activity ... and higher phase coupling in the **right** hemisphere. These findings corroborate the importance of **right**-hemispheric cortical networks in creative idea generation ... the present findings point to the importance of **right**-hemispheric cortical networks in creative cognition'.¹⁷ [The authors found increased **right**-hemispheric coherence in 'high originality' subjects and no hemispheric difference in those of 'average originality'.]
 11. '... those participants who produced more original ideas showed pronounced hemispheric differences in posterior regions of the brain ... with more upper alpha synchronisation in the **right** than in the left hemisphere, while in the lower originality group no hemispheric differences were observed'.¹⁸ (Plate 12[b] is taken from the paper, illustrating their point graphically.)

Of the two remaining papers, one found that, in highly creative subjects, thinking up a plot caused alpha synchronisation in the **right** hemisphere, whereas thinking of random words caused alpha synchronisation in the **left** hemisphere, a difference the authors attributed to the verbal nature of the second task, but which might also be attributed to its barely 'creative' nature.¹⁹ For example in another study, when participants generated unusual verbs for nouns, as opposed to the first verb that came into their head, there was, as one might expect, increased activity in the **right** middle and superior frontal gyri and **right** medial frontal gyrus.²⁰ The final study found greater complexity of the EEG during divergent than convergent thinking, commensurate with the fact that the first is broad, and the second narrow, in its recruitment of neuronal networks, but they draw no hemisphere-related inferences.²¹

An aside on the EEG, asymmetry and alpha activity. Neither the recording nor the interpretation of EEG data is easy. I could not begin to outline its intricacies here, but what the reader needs to know is this.

The electrical impulses in the brain generate waves that are by convention divided up into bands, on the basis of their frequency (that means their wavelength, not how often they are found). The alpha band, which is what we are principally concerned with here, is the dominant element of the normal EEG in the resting state. For that reason it was thought to be a sign of idling, because ‘nothing is going on’. When we focus on something particular, and engage in a task, beta waves become dominant. When we stop, beta is replaced by alpha again, and the normal state of things is restored. But EEG alpha band synchronisation during creative thinking is a sign of active cognitive processes rather than cortical idling.²² Another way of looking at this is that the normal, resting state is not when ‘nothing’ is going on, but when, to use an equivalent caricature, ‘everything’ is going on; and that ‘everything’ has to be reduced to ‘one thing’ in order to focus attention temporarily on an external source. Alpha suggests a high degree of readiness of potential: beta a collapse of potential into specificity.²³ Alpha rhythm, it turns out, is closely linked to issues of attention.

The idea that alpha is straightforwardly inhibitory – nothing is going on – first began to look like a cock-eyed story when it became clear that, when the imagination is working on memory (rather than just retaining a memory), alpha activity increased.²⁴ Growing evidence suggests that alpha is not by any means simply inhibitory, but, in a theme that readers of this book will begin to recognise, and with which readers of *The Master and his Emissary* will already be familiar, there is a kind of inhibition that is actually creative. Negation at one level can allow something at another level to flourish untrammelled. Alpha activity seems to be of this kind; and, to take an example, right posterior alpha seems to be involved with suppressing *external* visual processing and thereby releasing that very same part of the brain to deal with *internal* visual imagery. Alpha activity increases immediately we close our eyes. Closing one’s eyes when using the imagination is a commonly observed phenomenon. Alpha activity is consistently higher during the *imagination* of images (internal attention) than during their presentation (external attention).

The upshot of a complicated story is that, as far as we know at the moment, alpha synchronisation is involved with inner directed attention, with imagination, facilitating the combination of distantly related elements, and with creativity.²⁵

On that last crucial point, alpha activity has been found to be involved in ‘creative cognition’ in a series of studies employing a variety of methodological approaches.²⁶ ‘Taken together’, writes Matthias Benedek, one of the world’s leading EEG researchers,

there is evidence that alpha synchronization, especially in frontal and posterior parietal brain regions of the **right** hemisphere, is related to (1) creative task demands; (2) inter-individual level of creativity (more creative individuals show higher alpha activity); (3) originality of ideas (the generation of more original ideas is accompanied by higher alpha activity); (4) the subjective experience of insight (more alpha activity in insight vs non-insight solutions); and (5) stimulation of creativity.²⁷

The other point that needs to be appreciated is that, just as voltage is always the *difference* in electrical potential between two points, EEGs always measure *differences* in activity between any one point of interest and an electrical ‘reference point’. The choice of that reference point can make a significant difference to the detection or otherwise of asymmetry in EEG findings (as do a host of other things such as handedness, mood, personality and the exact nature of the task observed).²⁸ What this means is not that EEG data are useless, of course; just that the expectation that the same picture will emerge on every occasion is naïve. It makes the degree of consistency we *do* find more impressive than it would be if the situation were more clear-cut. If there is a lot of noise, but still a discernible signal, as in a poor quality TV transmission, it means (a) what you see is only a hazy outline of a clearer picture, and (b) you would be wrong to focus on the ‘snow’ as if it were part of the picture. Only one paper cited by Dietrich and Kanso saw broadly a left hemisphere picture; all the rest saw either no picture, or, much the most frequently, a broadly right hemisphere picture.

Returning to the papers listed above, one particularly interesting finding is common to the five papers referred to in paragraphs 7–11: namely, that there is a difference between what are termed highly creative individuals and averagely creative individuals, a difference which is not *linear* – that is to say, not just a difference of degree, but of kind. It is a matter of huge significance: that of right hemisphere dominance versus ‘no hemisphere

difference'. Indeed in one case (paragraph 8) the pattern was: high creativity – right>left; average creativity – left>right; and low creativity – no hemisphere difference.

This overall has two major implications. First, not dealing with truly creative individuals will dilute the obvious right hemisphere dominance, muddying the waters of creativity research. Second, not posing tasks that are truly creative, rather than at most minimally creative, is likely to have a similar effect – you won't really be testing what is special about creativity.

Overall then, I don't know about you, but on the evidence they've called so far, I feel Dietrich and Kanso have some work to do if they want to impress us with their view that the right hemisphere has no special role in creativity. But they now turn to the imaging data: perhaps it is here, after all, that we are in for the surprise of our lives. Introducing this section of their paper, they write: 'On the issue of hemispheric differences, the neuroimaging studies amplify the EEG data'. That hardly seems like a good thing from their point of view, but there we are. 'With the possible exception of two studies implicating the right prefrontal cortex,' they continue, 'none of the other 12 studies in this group can be viewed as supporting a dominant role for the right hemisphere, in part or whole'.

Let's take a look at the papers they proffer. The two that are 'possible exceptions' to this apparent complete lack of support for a dominant role of the right hemisphere are worth a look at the outset.

It has been noticed that schizotypes (a personality type characterised by what is called 'magical' thinking) are particularly creative. The first study looks at this in relation to the hemispheres.²⁹ Although, as Dietrich and Kanso concede, it supports a special role for the **right** hemisphere in creativity, I wouldn't rely on it myself. It is too difficult to know what we are looking at here. Schizotypes might in some cases have non-standard lateralisation of the brain, so that caution needs to be exercised in interpreting the study.

However, the paper does emphasise that, in normal subjects, the **right** frontal lobe is involved in generating unusual or distant verbal associations, while the left frontal lobe is involved in generating usual associations;³⁰ and that while divergent and creative thinking may be characterised by increased co-operation of the two hemispheres,³¹ there is evidence that it is specifically the **right** hemisphere that matters in creative thinking.³² It may also be, though they don't speculate on this, that 'increased co-operation of

the hemispheres' may refer to the left hemisphere not inhibiting the contribution of the right hemisphere to the same degree, since in the normal situation the left hemisphere does inhibit the right more than the right inhibits the left.³³

The second paper is more pertinent, because it looks at normal subjects.³⁴ It emphasises that the **right** hemisphere makes more distant and unusual connections than the left hemisphere.³⁵ Its own findings are that 'areas of the **right** prefrontal cortex are *critical* to the types of divergent semantic processing involved with creativity'. So a 'possible' exception to the total failure of support? No risk of overstatement there, at any rate.

Do the other 12 really offer no support, 'in part or whole', for a dominant role for the right hemisphere in creativity? Let's see.

Of those 12, two were unpublished conference presentation posters. I tracked down one. Sure enough, it had nothing to say about laterality at all.³⁶ The other I could not trace.³⁷ Another paper had little of its own to say about laterality, largely citing earlier literature in support of the right hemisphere's role.³⁸ A further paper I have referred to earlier, the study which found that the size of the corpus callosum was *inversely* associated with creativity; other than that it had nothing to say about laterality.³⁹

That left eight published papers.

1. One paper found **right** prefrontal activity in schizotypals doing creative tasks: schizotypals are more highly creative than normals.⁴⁰ But, once again, caution is required in interpreting this.
2. Another study found that the **right** prefrontal cortex was a 'critical component' of the neural systems responsible for set-shifting (thinking flexibly), and that a different part of the same **right** hemisphere region was importantly involved in generating and maintaining hypotheses.⁴¹ Right hemisphere areas in prefrontal cortex and cerebellum were active in proportion to the number of new solutions generated: the authors conclude that the **right** prefrontal cortex is playing a 'critical', and 'necessary (though not sufficient)' role.
3. A further study provides evidence which according to its authors 'partly' favours the **right** hemisphere over the left, and possibly 'non-conscious' processes.⁴²

4. A study of musicians found that (a) they were better at divergent thinking than non-musicians, and (b) recruited the **right** hemisphere, in addition to the left hemisphere that was relied on by non-musicians. 'Non-musicians may rely on a more left-lateralised, verbally mediated strategy that might hinder divergent thinking in this experimental context'.⁴³
5. Another paper⁴⁴ shows that of the areas activated in highly creative individuals, the two largest and most significant were both in the **right** hemisphere, despite the fact that the task was a verbal one. 'The score on the three creativity dimensions – fluency, originality, and flexibility– correlated with activation in **right** middle frontal gyrus and **right** rectal gyrus.' The authors also cite their own previous study,⁴⁵ which found that creativity was associated with the **right** precentral gyrus, **right** postcentral gyrus, the **right** gyrus rectus, **right** inferior parietal lobule, **right** parahippocampal gyrus and **left** middle frontal gyrus. 'Most of the brain areas that showed correlation were in the **right** hemisphere; however, correlations were observed in both cerebral hemispheres suggesting that creative thinking involves bilateral activation', they conclude.
6. A further paper showed results 'in line with the view that the **right** frontal lobe is more involved in spontaneous production of non-verbal representations, whereas the left lobe may exert control and secondary evaluative and verbal analysis', expressing the sensible view that the left hemisphere comes in at a secondary level as a checking mechanism. They found that their 'non-creative' group relied predominantly on the left hemisphere, whereas what distinguished the 'highly creative' group was that they recruited the **right** frontal cortex in addition.⁴⁶ This has been borne out in other studies of creativity.⁴⁷
7. A study of a neurochemical marker for cognitive ability, *N*-acetyl-aspartate, in relation to creativity found that it was its distribution in the **right** hemisphere, not the left, that 'predicted higher levels of creative potential as measured by divergent thinking tests.'⁴⁸ However, the authors reasonably enough conclude that anything 'as complex as creativity will never be localised in the brain'. I'd emphasise the word 'localise': we need to look at the global hemispheric picture, as always.

8. The last paper⁴⁹ we have looked at already: it found an association in the posterior right hemisphere EEG with a high degree of originality. It did not, however, find the association on functional imaging scans, where it found, instead, strong activations across most subjects in the **left** frontal region.⁵⁰

Once again, there is the finding in four papers (paragraphs 4–7) that the pattern is critical reliance on the right hemisphere in high creativity, less so or not at all in low creativity, and in one case actually reversed (paragraph 6) in low creativity, replicating a finding in the EEG series that we have just seen. This is likely to indicate that less creative people rely more on linear, sequential, mechanical processes for coming up with new ideas.

Imaging studies in this sort of situation are less reliable than almost any other sort of information. This is because it is not the mere *fact* of involvement, but the *nature* of the involvement that counts – something that requires interpretation. When you switch on a car engine, the fan starts busily whirring, but it doesn't propel the car. Compare the pre-ignition and the post-ignition states, however, and it will stand out as an area of reliable, highly localised and consistent change, compared with, say, the more diffuse, intermittent activity of the system of gears. The particular problems with functional imaging are legion, and many of them I have discussed already, so I won't recap them here. But, more generally, it's hard to tell from looking at a scan what is crucial. The extent of the involvement *on its own* can't be the key, not just because diffuse but significant activity over a larger area will not show up, compared to local but persistent activity in a less significant one; but because, even in contrasting a scan during the resting state with one during the activity under investigation, it may not be the *absolute* extent of an area's involvement in the second condition that matters, but the change *relative* to baseline that is likely to matter (for example, a change from 50 to 600 is more significant than a change from 1,500 to 1,600). And then there is what I have called the SAS effect– an apparently small addition may be the critical factor. I have discussed all of these previously. What that all adds up to is this: the scans are far from worthless, of course, but one needs, as always, to be guided in how to interpret a scan by as much information *from sources other than neuroimaging* as one can find. As we have seen most of that evidence,

much of it from lesion studies, roundly supports the key role of the right hemisphere: but Dietrich and Kanso ruled that out from the start.

How could Dietrich and Kanso have got it so wrong? Easy. Dietrich, at any rate, is an evangelical graduate of the School of Nothing Buttery. A look at the chapter titles from his book on creativity is revealing: ‘Flow experiences: from mystery to mechanism’, ‘The brief and frightening reign of the right hemisphere’, ‘Linearising pandemonium’, ‘Exorcising the ghost in the machine’. Poor chap – clearly terrified by anything that is not linear, mechanical and under control. Elsewhere he writes:

There is nothing *mystical* or *sacrosanct* about the *mechanisms* giving rise to this mental phenomenon. Progress on the neuroscience of creativity can only occur if we fully expose Cartesian muses for what they are: *teddy bears for grownups*. This is not to say that neuroscientists understand yet what happens in the innards of the *machine* when we are creative, but I hope to show here where we are and where we are going on this matter ... Without a path towards such an ersatz explanation, we have little hope to lift the dense fog enveloping our beliefs in the specialness of the creative process, the instinctive tug we feel that the creative spark comes from on high.⁵¹

‘Teddy bears for grownups’? Sounds more like a case of toys being thrown out of the pram to me. The cards are a little stacked here, so there’s not much point in taking this intriguing paragraph apart, since I am sure my readers can see for themselves its merits; though I note the obligatory cheery promise that we will find the innards of a machine if we only look a little harder for a little longer.

APPENDIX 2

HOAXES ARE NOT CONFINED TO THE FIELD OF SCIENCE

After making only minor changes to the opening chapter and plot synopsis of one of Jane Austen's novels, journalist David Lassman sent it to 18 of the biggest publishing houses in Britain. Every one turned it down. He then repeated the experiment with a further two of her novels, with the same result. Only on one occasion did anyone show signs of having spotted the theft from Jane Austen, and that, possibly, only because one of the proffered texts cheekily began with the unaltered opening line of *Pride and Prejudice*, probably the most famous such line in the English language: 'It is a truth universally acknowledged, that a single man in possession of a good fortune must be in want of a wife.'¹

It is worth devoting a few paragraphs to the two most celebrated hoaxes in the world of humanities publishing: the Malley affair and the Sokal affair.

Back in 1943, two decriers of modernism, James McAuley and Harold Stewart, invented a poet called Ern Malley, and 16 poems which they attributed to him, submitting them to the Melbourne magazine *Angry Penguins*. The editors of the magazine were so taken with the poems that they devoted a whole issue to them, presumably enraptured by the fact that they could make no sense out of them, since, according to the authors, none was put there consciously by themselves: 'We opened books at random, choosing a word or phrase haphazardly. We made lists of these and wove them in nonsensical sentences. We misquoted and made false allusions. We deliberately perpetrated bad verse, and selected awkward rhymes from a *Ripman's Rhyming Dictionary*.'²

Readers of *The Master and his Emissary* will know that I am not a fan of pretentious nonsense in contemporary art, and I accordingly applaud the audacity of McAuley and Stewart, much as I applaud the exhibition of the Parisian painter Pierre Brassau in 1964.³ Art critics, journalists, and students, glasses of wine in hand, silently contemplated Brassau's creations. Their praise was almost unanimous. Rolf Anderberg of the *Göteborgs-Posten* later wrote that most of the works at the show were 'ponderous', but not those of Brassau:

Pierre Brassau paints with powerful strokes, but also with clear determination. His brush strokes twist with furious fastidiousness. Pierre is an artist who performs with the delicacy of a ballet dancer.

One lone critic panned Brassau's work, declaring 'only an ape could have done this'. As it turned out, this was correct. Pierre Brassau was, in fact, an ape. Specifically, he was a four-year-old West African chimpanzee named Peter, from Sweden's Borås Djurpark zoo.

But of course the difficulty here is in adjudicating value: McAuley and Stewart may have consciously tried to be nonsensical, but unconscious associations are what poetry is about – and they wouldn't have been conscious of them, would they? They might have produced, despite themselves, some good lines (the chimp might even have daubed a good daub). I've read considerably worse. After all, one strand in modernism, absurdism, actually advised such 'aleatory' processes as a way of writing. In 1961, as a gesture of defiance, the editor of *Angry Penguins* re-published the Ern Malley poems, maintaining that whatever McAuley and Stewart had intended to do, they had, in fact, produced some memorable poems, presumably confirming the absurdist point the authors had hoped to deflate.

Another famous example of such a sting from the humanities is that perpetrated by Alan Sokal, a professor of mathematics at University College London, and of physics at New York University. In 1996 he submitted an article, which he considered to be a farrago of pretentious nonsense, to a journal called *Social Text*. He presented himself as someone from the science world who was prepared to rethink its dogmas in a postmodernist framework. What he submitted was not computer-generated, but it was pretty richly interspersed with fashionable jargon and unverifiable claims. Its thrust was that the findings of science were more or

less entirely socially constructed (not at all a position, incidentally, that I would support, though I would not support the idea that they were always wholly immune from social construction, either: in philosophy things are rarely cut and dried).

However, the impartial observer cannot help noticing that this is not in the same league as the cases from science publishing. First of all, it was, at least, written by a human being, and read and considered by real, human, editors: that is, it got to first base. It made at least superficial sense, even if Sokal had made an effort to be vacuous, delivering what he called ‘a pastiche of left-wing cant, fawning references, grandiose quotations, and outright nonsense’.⁴ In addition Sokal’s claim for his article’s vacuity relies partly on having invoked ideas that are just ‘known’ by all right-thinking scientists to be false, such as that of morphic resonance, an idea formulated by Rupert Sheldrake, and that therefore just mentioning them should be enough to evoke dismissive hilarity. Sheldrake is an unashamedly controversial scientist. He is a man who, with five publications in *Nature*, a journal in which most scientists would be overjoyed at getting even one publication in an entire lifetime, a Frank Knox Fellowship at Harvard in science and philosophy, a Fellowship at Cambridge University in biochemistry and cell biology, and a Research Fellowship of the Royal Society (Britain’s most ancient, and most prestigious, scientific body) behind him, is quite capable of practising conventional science at the highest level. However, because he dared to take seriously ideas that are commonplace in oriental traditions, as well as being found in the writings of, in the West, for example, Goethe, the editor of *Nature* John Maddox entitled his review of Sheldrake’s thoughtful and confessedly speculative book on morphogenetic fields, ‘A book for burning?’ Maddox lived to express regret at this turn of phrase. But this is what scientists, unfortunately not quite as devoid of dogma as their own dogma suggests, sometimes inflict on one another, to the detriment of openness and scientific progress.

Sokal’s editors claim that they ‘requested him (a) to excise a good deal of the philosophical speculation and (b) to excise most of his footnotes’, in which some of his riper remarks featured, but apparently he declined. While some of the ideas that Sokal just assumed must be nonsense may indeed be so, some may not. I do not say that a more robust piece of nonsense could not get past editorial scrutiny and into print in some humanities journal. I

am sure it could. Indeed Peter Boghossian's brilliant hoax piece, 'The conceptual penis as a social construct', was published in a journal called *Cogent Social Sciences* without a murmur, claiming that 'the penis *vis-à-vis* maleness is an incoherent construct'.⁵ In retrospect the name of the journal would appear to have given hostages to fortune. But given some of the material that gets into print in science, the Sokal affair can't, at the very least, be claimed to be a problem exclusive to 'far out', fringe leftist publications in the humanities, never mind of the humanities in general.

More recently the Sokal hoax has been repeated with blatant nonsense being submitted by three scholars to journals in fashionable subdisciplines. At least seven such papers were accepted for publication. Their offerings include ones that argue that dogs experience rape culture, and might 'suffer oppression based upon (perceived) gender', that men who masturbate while thinking about a woman without obtaining her consent are perpetrators of sexual violence, and that 'western astronomy' is sexist and imperialist, such that physics departments should study feminist astrology – or practise interpretative dance – instead. This has been dubbed Sokal Squared.⁶

APPENDIX 3

WHY WE SHOULD BE SCEPTICAL OF 'PUBLIC SCIENCE'

This evidence should not be read in isolation from its context in the overall argument of Chapter 13.

Wider political and economic forces outside the world of science have their impact, and may contribute to undermining the credibility of science itself. For instance, it has been known for years that low fat regimens lead to no improvement in all-cause mortality figures – partly because low fat makes people anxious, and increases levels of accidents and suicides. More recently 20 years of public 'health management' on this issue, in the name of science, was declared not just to require reformulation in the light of new evidence, but never to have had any basis in fact.¹ Meanwhile an investigation by the *BMJ* had produced suggestive evidence that the official US government advice on diet had deliberately ignored inconvenient science:

The overall lack of sound science and proper methods in the 2015 report could be seen as a reluctance to depart from existing dietary recommendations. Many experts, institutions, and industries have an interest in keeping the status quo advice, and these interests create a bias in its favour ... it's important to note that in a field where public research dollars are scarce, nearly all nutrition scientists accept funding from industry.

But, the author continues: 'of far greater influence is likely to be bias in favour of an institutionalized hypothesis [one widely accepted by the

science establishment] as well as a “white hat” bias to distort information for what is perceived as righteous ends.’ ²

The prevalence of the ‘white hat’ phenomenon is extraordinary and fascinating in its own right.³ This refers to the tendency for people in positions of influence in science policy units to think that because they just know, without going through the tedious process of examining the evidence, that, for example, fat, or salt, or alcohol, must be, in general, dangerous to the health of a nation, the very respectability of science would be at stake were these private fantasies not to be supported (in the early twentieth century similar attitudes could be found applying to homosexuality, masturbation and refusal to wear a vest). This tendency inevitably produces the opposite result, because unjustified claims redound to the discredit of science. It is not science, may I reiterate, that is at fault here, but the irresistible urge in some people to exert power, especially if it involves interfering with pleasure. Damagingly, it takes place in the name of science. And much of it, because it is the public face of science, is taken by the public at large as being the voice of ‘science’ – when it is really the voice of over-regarded bureaucrats. For this reason health recommendations deserve a little scrutiny.

I do not set myself up as any kind of authority on dietary health, nor am I giving any kind of health advice. Fortunately that is not my job. Nor do I have to attempt to give a full and impartial summary of the scientific evidence on these matters: that is the onerous duty of public science bodies. Mine is the very much easier task of demonstrating how blatantly they fail: to act, if you like, for a while, the gadfly on the opulent rump of public science.

Recently the salt issue has come back into focus. Despite clear evidence that we are focussing on the wrong white crystals – salt, rather than sugar – there is still, according to many experts, ‘a very strong need’ to raise awareness of the adverse consequences of *low* salt intake, in order to ‘facilitate better clinical guidance.’⁴ I have no privileged information on this topic, but it has been suggested that the sugar industry put a lot of money into turning the spotlight on salt and fat, partly in order to deflect attention from the damaging effects of sugar, and partly because commercially produced food that is low in fat and salt has to be rendered palatable by the addition of sweetness.

Most people would be surprised to learn that low sodium actually causes the laying down of fatty plaque in arteries.⁵ A 16-year follow-up study found people with *higher* combined intakes of sodium and potassium had the lowest blood pressure.⁶ A major study in the *Journal of the American Medical Association* in 2011 found that higher salt consumption not only did not increase risk for hypertension (abnormally high blood pressure) and did not increase risk for cardiovascular problems, but on the contrary low salt consumption predicted higher cardiovascular mortality.⁷ The fairest assessment appears to be that there is a J-shaped distribution, with very low levels and (in some people) very high levels carrying risks.⁸ But blanket reductions in the general population, rather than in a small, carefully targeted population, are not justified, and may actually cause harm.⁹ Even in patients with congestive heart failure, those on a normal, rather than a reduced, sodium diet required significantly fewer readmissions to hospital and did better on a range of markers.¹⁰

James DiNicolantonio, a cardiovascular research scientist who is also Associate Editor of *BMJ Open Heart*, the *British Medical Journal*'s specialist cardiology publication, points out that contemporary levels of salt consumption are at a historic low, and that consumption of salt in periods for which we have estimates – Roman times, and during the last several hundred years throughout Europe – was probably at least twice, and even up to 10 times, what it is today, since it was a principal means of preserving food in an era before freezers.¹¹ During the last 100 years hypertension has tripled in the US, while salt consumption has remained stable. Hypertension and heart disease simply do not parallel salt consumption – indeed if anything, as he demonstrates, they are inversely proportional. According to him, the salt–blood pressure hypothesis was invented by two French scientists in 1904 based on just six patients.¹² Since then, ‘research missteps, arrogance, funding conflicts, [and] a stubborn refusal to relent’ have resulted in bad science – and these factors are, according to DiNicolantonio, still present today. The story makes fascinating, if troubling, reading.

Our bodies carefully regulate the amount of salt, through taste, to make sure they get what they need. Our own age is no exception to the historical norm. Animals and humans die without salt, as it is essential to normal human physiology; it is dangerous to try to eliminate it, or even severely to reduce it, in human diet. A low sodium regime is associated with

depression, as well as with reduced libido and fertility, not to mention erectile dysfunction, fatigue and sleep problems.¹³ We have been actively harvesting or mining salt for at least 8,000 years, and it is no doubt far from coincidental that wars have been fought over it, and that, according to Pliny, soldiers were once paid in it (the origin of the term *salary*).¹⁴ We need it in order to be healthy, and that is, no doubt, one of the reasons that nature has ensured we sense that food without salt is unspeakably dreary.

But this has not stopped public scientists telling us that we should drastically reduce salt intake in the interests of health. One influential mid-twentieth-century doctor and research scientist intoned:

There must be total war. Attacking one factor is not enough. Reducing the sodium is not enough; reducing cholesterol is not enough; reducing fluid and amino acids is not enough. Simple reduction is not enough ... ¹⁵

A cross-sectional study of salt levels and blood pressures in 52 populations, called ‘Intersalt’, is often cited as support for the hypothesis that salt consumption parallels rises in blood pressure, but the data are contradictory.¹⁶ Four of the populations (Kenya, Papua, and two Indian tribes in Brazil) do have low levels of salt and blood pressure. Across *the other 48* populations, however, blood pressures go down as salt levels go up—contradicting the hypothesis. This aspect is not often reported. Nor is a large well-conducted general population study at the individual level, contradicting the salt hypothesis, which happens to have been published in the very same issue of the *BMJ* as Intersalt— but has received much less publicity (about a sixth the number of citations to date).¹⁷ Why? David Freedman, a professor of statistics and mathematics at the University of California, Berkeley, and Diana Petitti, an epidemiologist, think they may know one reason:

One segment of the public health community—funded by the National Heart Lung and Blood Institute and endorsed by many journals in the field—has decided that salt is a public health menace. Therefore, salt consumption must be drastically curtailed. The force with which this conclusion is presented to the public is not in any

reasonable balance with the strength of the evidence. Programs, once in place, develop a life of their own; the possibility of health benefits becomes probability, and probability becomes certainty. After all, the public is easily confused by complications, only professionals can weigh the evidence, and where is the harm in salt reduction? The harm is to public discourse. The appearance of scientific unanimity is a powerful political tool, especially when the evidence is weak. Dissent becomes a threat, which must be marginalized. If funding agencies and journals are unwilling to brook opposition, rational discussion is curtailed. There soon comes about the pretence of national policy based on scientific inquiry—without the substance. In our view, salt is only one example of this phenomenon.¹⁸

And in any impartial observer's view there are numerous others. The case against salt is not proven. Let us turn to the problem of alcohol.

In Britain, warnings about the risks of alcohol are frequent and repetitive. Recently both men and women have been warned to limit alcohol intake to 14 units a week, and reduce the number of drinking days. How scientific is all this?

In July 2015 an 'epidemic' of alcohol abuse was reported among the better-off middle class in Britain. This was a somewhat puzzling time to detect an epidemic, since alcohol consumption in Britain had been falling steadily, year on year, for the previous 10 years. Moreover, the paper, which triggered a flurry of newspaper reports, stated that 'people in better health, higher income, with higher educational attainment and socially more active are more likely to drink at harmful levels'. (Apologies for the grammar, which is not mine.) Though presented as news, it was anything but: similar findings had, in fact, been available for 25 years from all over the world – certainly from Sweden, Belgium, the US and even India. The report concluded:

people aged 50 or over ageing 'successfully' in England are more at risk of drinking at harmful levels ... than those who fit less well into the paradigm of ageing 'successfully'.¹⁹

How, one wonders, could this have been seen as a problem, let alone an epidemic? The facts presented lead to the conclusion that the inverted commas should be round the word ‘harmful’, not ‘successfully’. When the data don’t fit a study’s assumptions, the preferred response is to review the assumptions, not struggle to make the data say something they – clearly – don’t. I wondered if journalists had simply failed to report something crucial here, such as that these successful, well-educated, sociable, healthy people were in for a terrible shock. In a few years’ time they would be dying early of their habit. After all, cancer has been known for a long time to have an association with alcohol in some cases, though to a relatively small extent. Interestingly, impressive data on cancers and alcohol were published a few days later in the same prestigious journal, the *BMJ*.²⁰

This was a definitive study, involving over 88,000 subjects followed up over 24–30 years: it would be hard to find a better data set. One of the declared aims of the study was specifically to separate the effects of drinking alcohol from those of smoking, an issue that had hitherto ‘not been settled’. They found, as expected, a risk from drinking and smoking. But having separated out the risk from drinking from the risk from smoking, they conceded that the ‘independent influence of alcohol, especially in the range of light to moderate drinking, could be minimal’. That is probably an understatement, since their own data show that, after removing the effect of smoking, in men there is not only no significant overall increased risk of cancer of all kinds at light to moderate drinking levels, but none in the group of those termed ‘harmful drinkers’, either. In women there is a small rise in the risk of ‘alcohol-related’ cancers, a relative risk of between 1.1 and 1.2, ‘driven’ by breast cancer. But that must itself be contextualised. The annual risk in the UK of dying of breast cancer (for women) in 2017 was 33 in 100,000 – presumably lower now, as it has been dropping for years.

Most people die of cancer or cardiovascular disease. You might wonder, since cancer is not responsible, if there was, then, a significant tendency for alcohol to increase death from cardiovascular causes. This seems highly unlikely. According to the Harvard School of Public Health,

more than 100 prospective studies show an *inverse* association between moderate drinking and risk of heart attack, ischaemic (clot-caused) stroke, peripheral vascular disease, sudden cardiac death,

and death from all cardiovascular causes. The effect is fairly consistent, corresponding to a 25% to 40% reduction in risk.²¹

Now that is far from being a negligible effect: a considerably larger *protective* effect than even the more highly publicised 10–20% increase in risk of breast cancer for women, and one that would make a pharmaceutical company, if it could patent and market alcohol, rich.

Another candidate might have been diabetes. However, a huge follow-up study from Denmark, looking at over 77,000 people over a period of five years, confirmed previous extensive evidence of the protective effect of alcohol,²² demonstrating that no level of drinking included in their study (their cut-off was 40 units a week for men, 28 for women) was associated with as high a risk as not drinking at all. The maximum benefit was associated with drinking 14 units a week in men, and 9 units a week in women, associated with a very large reduction in risk – 40% in men and 60% in women. At no level did the risk return to, still less exceed, the level of risk associated with not drinking.²³ This did not, as far as I am aware, get much coverage. I imagine this has to do with the ‘white hat’ syndrome: everyone just knows that alcohol can only cause harm.

In October 2015 there were warnings of dementia. ‘Health authority urges people to reduce alcohol intake, stop smoking and eat more healthily when they hit 40 to avoid ill-health in later life’, read a headline in *The Guardian*, a respected liberal British newspaper, referring to new ‘guidance’ from NICE, the government-sponsored National Institute for Clinical Excellence. Since smoking and gross obesity are certainly important risk factors for ill-health, I was curious to know what effect alcohol contributed.

I consulted each of the four papers proffered by NICE in evidence. Three of them referred to socioeconomic factors affecting drinking and access to ‘treatment’, without however presenting evidence that ‘treatment’ was necessary. The authors at the same time acknowledged that getting people to change is difficult because of the ‘pleasure associated with drinking’. When the evidence about the impact of drinking on ‘health and quality of life’ was explicitly addressed, the authors concluded: ‘No evidence found’. The fourth report advised that no recommendations should be made about drinking levels, since the authors had no way of identifying what safe or unsafe meant here.²⁴

Early in 2015, a study had reported in the *BMJ* that, in a group of Alzheimer's patients, moderate alcohol consumption was associated with a significantly lower mortality over the year and a half of the study.²⁵ But NICE could hardly have done better than refer to a huge systematic meta-analysis of the evidence from 45 studies on alcohol and dementia, also published in 2015 in *Current Clinical Pharmacology*.²⁶ It found that 'light to moderate drinking may decrease the risk of Alzheimer's disease and dementia, whereas heavy to excessive drinking does not affect the risk'. The authors conclude that there is insufficient evidence to suggest abstainers should actually take up drinking on health grounds.

In February 2016 *The Times* reported Britain's then Chief Medical Officer, Dame Sally Davies, as saying that a 'single drink is one too many', advising that consumers should think of cancer every time they held a glass of wine or poured a can of beer. This bizarre pronouncement has done little to improve the credibility of public science.

As I write, a study of the US population has been published online, looking at factors that determine longevity, and a life free from disability, in a large sample of 'nationally representative' subjects aged between 50 and 74, taken from the Health and Retirement Study, 'a high-quality ongoing longitudinal survey on health among Americans aged fifty and older and their spouses that began in 1992'. This particular study focussed on three factors: obesity, tobacco use and drinking habits, yielding seven possible categories: obese, non-obese; never smoked, ever smoked; and heavy, moderate and 'non- or irregular' drinkers.

In both men and women, hardly surprisingly, the earliest onset of disability was in the obese group. But of all seven groups, in women the *latest* onset of disability was in the moderate drinkers, followed by the heavy drinkers. In terms of longevity, moderate drinkers were the longest lived of all, *followed* by never smokers, and, next, heavy drinkers. The shortest lived were smokers, followed by 'non- or irregular drinkers'. In men, of the seven groups, those with the latest onset of disability and the longest lived were the never smokers. In terms of longevity, non-smokers were, however, closely followed by the moderate, and then by the heavy, drinkers. Once again, apart from smokers, the shortest lived were the 'non- or irregular drinkers'.²⁷

This is a powerful study whose results are worth knowing. Not only can I not remember it being reported in the press, but the abstract of this paper,

which is all that most people will read, or the final section, which is actually entitled ‘Policy Considerations’, says nothing of the effect of alcohol on both postponing disability and increasing longevity. Instead the only mention of alcohol under ‘Policy Considerations’ is that there is ‘solid evidence of the effectiveness of financial “sticks” such as taxes’ on decreasing its consumption, and a suggestion that policies should discourage ‘immoderate alcohol consumption’. ‘Immoderate’ is, of course, one of those words that brooks no argument and begs all the questions, and of course there is evidence that at some point it becomes harmful: but the point is that, from a purely scientific point of view, this paper does not contain any. It has only positive things to say about drinking at all levels – except the lowest, which could be construed as a serious risk. If the paper’s authors are really concerned either with science or with helping people lead long and happy lives this should be one of their most publicised findings.

The latest paper to hit the headlines is from the Institute for Health Metrics and Evaluation (IHME) funded by the Gates Foundation.²⁸ The fashionable but unscientific message seems to have blinded the editors of *The Lancet* to the quality of the research, which they, for some reason, decided to publish. The study, using a methodology described by Sir David Spiegelhalter, Winton Professor for the Public Understanding of Risk at the University of Cambridge, as ‘complex (and rather opaque)’, concludes there is no safe level of drinking, and, as is often the case, calls for a concerted campaign of excise taxes on alcohol, limited physical availability of alcohol, reduced hours of sale, and curbed alcohol advertising, amongst ways of reducing alcohol consumption. According to Spiegelhalter, if the authors had looked at all-cause mortality they would have found ‘a dramatically higher risk in non-drinkers’ – which is in keeping with what we have consistently seen. He calls the authors’ conclusions ‘bizarre, to say the least’, and having looked at some of the reasons why they reached such deeply flawed conclusions, concludes ‘whatever the cause, it would seem inappropriate that this paper, as it stands, is part of the scientific literature’. He noted that the paper’s ‘apparently spurious conclusion is now being quoted uncritically in media stories in the *Daily Mail*, *Daily Express* and *Evening Standard*’.²⁹ Which indeed it was.

The report begins by identifying a range of conditions to which alcohol can be a contributory factor and then estimates what that means in terms of the global contribution of alcohol to risk. It neither takes into account the

benefits, nor, contrary to good practice, reports absolute risks (rather than relative risks), nor asks what level of risk we are willing to tolerate. This is like starting from the observation that there is a range of illness or injury to which football can contribute, ranging from joint injuries, to fractures, to heart attacks, to head injuries, and then multiplying up by the number of people who play football worldwide. Unsurprisingly you will discover that there is no level of football that does not carry a risk, and that its worldwide burden is significant. The implication then would be that the government should do everything in its power to prevent football. Such a report might state that you increase your chances of breaking a limb *threefold*, without telling you that your chances of breaking a limb are generally very low, about 0.5%, and that a threefold increase still means only 1.5%, not a high risk – and one that many would willingly accept in order to have the pleasure of taking part in a sport (hence the need to report absolute, not relative risks). And it doesn't tell you that football carries benefits – as even the riskier businesses of swimming, riding and skiing do.

An alcohol study based on these principles doesn't take into account the benefits that are uncovered only by longitudinal studies of individuals, such as the Health and Retirement Study discussed above, or a scientifically superior paper published only four months earlier in *The Lancet*, which found that 'in current drinkers of alcohol in high-income countries, the threshold for lowest risk of all-cause mortality was about 100 g/week.'³⁰ You need to follow real individuals, not make a lot of assumptions from aggregated data from grossly different cultures and fail to include comparisons with all-cause mortality.

As Spiegelhalter commented, the data in the IHME study showed only a very low level of harm in moderate drinkers and suggested UK guidelines were very low risk:

Given the pleasure presumably associated with moderate drinking, claiming there is no 'safe' level does not seem an argument for abstention ... There is no safe level of driving, but government do not recommend that people avoid driving. Come to think of it, there is no safe level of living, but nobody would recommend abstention.³¹

My purpose, clearly, is not to argue that alcohol is harmless: of course not. I am a physician. I know how gross excess can destroy careers and families, health and happiness. It can be lethal. At one time I was the medical consultant to a team of skilled therapists that helped many alcoholic patients to quit their habit, which for them had become damaging. But there are pleasures, even virtues, in alcohol, known since the dawn of civilisation. This is an area for balance, not hysteria.

The hectoring by bureaucracies is unhelpful. The original recommended levels for the safe consumption of alcohol in Britain are known to have been plucked from thin air (I have that on the authority of someone who sat on the committee that produced the recommendations). Reducing them is about as scientific. The only thing that had a basis in science, and a well-established one, was that women tolerate alcohol less well than men.³² That was removed from the ‘guidance’, presumably because political correctness trumps reality.³³

I have spent a little time on this because it so beautifully exemplifies two things germane to my overall argument: that true science is not at fault, but is brought into disrepute by the arrogant claims of those who speak in its name, claims which often flatly contradict the evidence; and that balance and harmonisation are less important in a left hemisphere-dominated culture than linear thinking. Such thinking gives power to bureaucrats and administrators, without simultaneously furnishing them with an understanding of what life is about. Science, both in the specialist research arena, and in the public arena, is being betrayed by such left hemisphere ways of thinking.

In Britain, the pub has for a thousand years been one of the mainstays of community life. Social connectedness is, for the health of a people, more important than anything else – and that means for both their mental and physical health.³⁴ So marked are the effects of social connectedness on health, not to mention happiness (without which there is little point in health), that they outstrip even those of diet, exercise and smoking. Laws that aim to reduce risk to zero are pursued by committees whose *raison d’être* is to carry on pushing until they succeed in enforcing total abstinence. It is not to be expected that they will think about the massive downside associated with trying to shield us from risk, so as eventually to die without having lived. We should push back.

Somebody memorably described life as a sexually transmitted terminal disease. Nothing in this world is safe: the art of life is balancing risk with richness. As Paracelsus said, ‘Everything is poison – only the dose makes the difference’. Surely not water, you might say? Yes, even water can be toxic in gross excess, leading to a rare condition (not, however, so rare that I have not seen it in clinical practice more than once), known as central pontine myelinolysis, a degradation of the nerves in part of the brainstem called the pons, which is potentially fatal.

And so can food be fatal. Clearly the obese die young, as well as impairing their quality of life in a host of ways: that is uncontested. But is it good to be thin? And what is fat? A major study published in March 2016 suggested that ‘a large proportion of US adults are misclassified as cardiometabolically unhealthy according to BMI [body mass index] categories’: overall misclassification in both directions caused by relying on BMI affected about 75 million individuals in the US alone – almost a quarter of the entire population.³⁵ In 1985 two British scientists, JS Garrow and JD Webster, had decided which BMI should be officially classified as overweight. It was a rough estimate, and one that fitted the leaner 1970s population. One scientist is quoted as saying: ‘The cut-off for overweight was made to be a BMI of 25. Partly it was a nice round number.’³⁶

Finally, there is the successfully marketed idea that we are all dehydrated. Much of the ‘research’ into this area is funded by water bottling companies, that cause huge pollution by freighting water round the globe, contribute to the plastic detritus that ends up in the oceans, and leave people feeling anxious and vulnerable. Though it has never been a consistent pronouncement of public science, the craze for bottled water reveals the deleterious impact of commerce on common sense. No-one knows where the idea that you need to drink ‘8 × 8’ (8 glasses of 8 oz of liquid per day), or even the more modest six to eight glasses of water a day, comes from.³⁷ Possibly it comes from the fact that that’s about what you consume anyway, including in food, if you don’t think about it. But the idea that explicitly more and more is better for you is baseless. The idea is promoted by organisations that have the backing of Danone (who produce Volvic, Evian, and Badoit) and other bottled water manufacturers. There is no good evidence that you need to do any of this, or that bottled water is better for you than tap water, although it undeniably causes significant harm to the environment through the needless generation of plastic waste and the

transport of huge volumes of water from place to place – something that only started happening, ironically enough, when tap water became safe to drink almost everywhere in the developed world for the first time in history. It is also the same people who are keen on ‘listening to’ their bodies that carry round bottles of water; in this, oddly like mothers that believe in their children’s independence, yet make sure that they are independent by following their every move. Thirst alone is apparently no longer good enough as a suitable measure of water requirement. If you lose sight of your water bottle in spite of all warnings, you can now download a drinking app for your mobile phone. A shrill beep then reminds you at regular intervals that the body’s water level has fallen again, and that urgent replenishment is needed.

In all processes there is a balance to be struck. There is always such a thing as enough. One rarely hears, however, of an administrative body concluding that it has now done enough. Once invented, it carries on pushing in the same direction, marching to the same slogan, even if the reason for adopting the slogan no longer applies – and currently there are few mechanisms for stopping its progress. This is not just a problem in science, of course: it is a prevailing problem of modern life.

THE MATTER WITH THINGS

*Our Brains, Our Delusions
and the Unmaking of the World*

Iain McGilchrist

• VOLUME TWO •

What Then is True?

PART III

The Unforeseen Nature of Reality

The universe is not to be narrowed down
to the limits of the understanding, which has been men's practice
up to now; but the understanding must be stretched and enlarged
to take in the image of the universe as it is discovered.

— SIR FRANCIS BACON¹

To say that metaphysics is nonsense *is* nonsense.

— FRIEDRICH WAISMANN²

In our description of nature the purpose
is not to disclose the real essence of the phenomena
but only to track down, so far as it is possible,
relations between the manifold aspects of our experience.

— NIELS BOHR³

¹ Bacon 1858b, *Parasceve ad historiam naturalem et experimentalem*, aphorism 24.

² Waismann 1968 (38; emphasis in original).

³ Bohr 1961 (28).

THE COINCIDENTIA OPPOSITORUM

A thing without oppositions *ipso facto* does not exist ... existence lies in opposition.

—CS Peirce¹

It is the hallmark of any deep truth that its negation is also a deep truth.

—Niels Bohr²

The heart's wave would never have risen up so beautifully in its cloud of spray, and become spirit, were it not for the grim old cliff of destiny standing in its way ...

—Friedrich Hölderlin³

ACCORDING TO AN ANCIENT IROQUOIS LEGEND, THE GRADUAL FADING OF eternal power and light in the cosmos made necessary the activity of a creator god whose task was, for the sake of the whole universe, to bring into being the earth and all its creatures. His name in the Onondaga language, *De'haěⁿhiyawă'khoⁿ*, means He Grasps The Sky With *Both* Hands (my emphasis); and in the legend, he represents the power to remember one's higher identity in the midst of action in the world. He has, however, a twin

brother who declares: 'I am not thinking about the place from where I came ... It is sufficient that my mind is satisfied in having arrived at this place ... This place will become exceedingly delightful and amusing to the mind ... I trust in the thing which my father gave me, a flint arrow, by which I have speech. This I will use perhaps to defend myself so that I will not think of that other place.' His name is *O'ha'a*, which means He Who Is Crystal Ice, He Who Is Flint; subsequently he is referred to simply as Flint. He represents 'evil in the form of forgetfulness, intentional forgetfulness of the higher identity'.⁴

He Grasps the Sky With Both Hands begins creating living creatures. Flint sees the animals that his brother creates and how good they are; and he is jealous. He gathers all his brother's animals together and puts them in a cave. Troubled by this, He Grasps The Sky With Both Hands tries to cut himself off from his brother. Flint then tries on his own to imitate his brother. He creates his own birds, flowers and fruits. His brother is more troubled than before. But his realisation is that it is only when Flint is cut off from his brother that he does wrong. So He Grasps The Sky With Both Hands rescinds the act of separating himself off from the evil, and returns to his brother to see what he has done.

It turns out that Flint has created not birds, but flies and bats; not flowers, but thistles; not fruit, but thorns.

Seeing this, the good brother embraces his brother's work, giving all that Flint has made their proper names (that is, assigning them their proper role in the scheme of things) and declaring, 'All this shall assist me. The flies shall assist me. The thistle will be food for small animals, the thorn will be food for game animals ...' The mind of Flint was gratified. But Flint goes on attempting to imitate the works of creation, and He Grasps The Sky With Both Hands comes to understand that it is right that he maintain a *small distance* from his brother, while at the same time keeping his attention upon him, neither letting him drift too far from his awareness, nor letting him blend with him. The good brother understands full well that Flint will forever attempt to destroy his rule.

He Grasps The Sky With Both Hands consults an 'Ancient One' who confirms this: Flint will aim to destroy his benign superintendence of

creation.

He Grasps the Sky With Both Hands goes back to the most primitive source of being. From it he brings the light of the sun into the world. He starts to create human beings, a man and a woman. Into each he sees it is good that he should give some of his own life, his breath, his mind and his power of speech.

But all is not well. Seeing what his brother has done, Flint decides that he too can make human beings. Flint's experiments, however, result only in strange, anguished, misbegotten creatures that run from him and hide. So he turns to his brother for help.

As Flint prepared to cross once again the narrow channel that separated him from his brother, he was startled to see that He Grasps The Sky With Both Hands had already crossed the water and was coming towards him. Flint greeted him, saying, 'I have come to meet you because I desire your aid in causing the human being to live'.

He Grasps The Sky With Both Hands agreed and went to the place where the human being was. He Grasps The Sky With Both Hands took a portion of his own life and put it inside the human being. So also he took a portion of his own mind and enclosed it in the head of the human being. And so also a portion of his own blood and enclosed it inside the flesh of the human being. And so too did he take a portion of his own power to see and enclosed it in the head of the human being. So also he took a portion of his power to speak and enclosed it in the throat of the human being. Finally, he also placed his breath in the body of the human being. Just then the human being came to life, and he arose, and stood upon the earth present here.

Turning to Flint, He Grasps The Sky With Both Hands spoke: 'I now have aided you in this matter. And now, I see that *this* human being will become hostile to me. What will come to pass because of that?'

Flint quickly replied, 'Since both you and I took part in completing this human being, let both you and I have control over it. In that way you will have something to say concerning these human beings who will dwell on this earth.' He Grasps The Sky With Both

Hands agreed to that, adding: ‘That human being whom I alone created, who is the first human being to become alive on this earth – we shall call him real human being. And this human being whom you and I have now created and is now alive on this earth, we shall call him the hatchet maker, the bringer of strife.

In time, the moon is created, initially under the power of Flint and evil, but it eventually comes under the power of the good brother. The brothers depart the realm of this earth. But He Grasps The Sky With Both Hands, before he leaves, warns that there are two minds in human beings; and that if they pursue strife, rather than peace, they will end

in the place where my brother dwells. And there you will see great suffering, and you will be famished, and you will be without liberty, and you will share the fate of my brother. I have confined him, and I have kindled a fire for him, and for this purpose I used his anger. This fire is hotter than any fire you have ever known; and this fire will burn eternally in that my brother even now desires to control all minds among human beings.

‘Whichever mind you choose, you must obey it’, he says. If mankind forgets, He Grasps the Sky With Both Hands will try to intervene twice on behalf of mankind, but

if a third time it comes to pass that you forget, then you will see what will come to pass. The things upon which you live will diminish so that finally nothing more will be able to grow ... It will be my brother who will do all this, for he will be able to seduce the minds of all human beings and thus spoil all that I have completed. Now I leave the matter to you.

This extraordinary legend appears to me to be one of the most remarkable intuitions of the structure of mind and its influence on human destiny ever brought forth from the depth of the human imagination. There are many close parallels between its message and the account of hemisphere

difference expounded in the course of this book, as will be obvious to the attentive reader.

Further, though a creation myth, it is one with an important difference. It is not merely a myth of a completed act of creation, dealing solely with origins, but an account which also looks forward: to creation as continuous. What's more, being an account of creation (of how worlds are brought into being) provided by a legend that intuits the structure of the mind, it concerns not simply 'the world' in a more limited sense, but the phenomenological world, the world that comes into being by the engagement of the human mind with whatever-it-is-that-exists-apart-from-ourselves: the only world we can ever know. At the risk of encroaching on the beauty and wisdom of myth, I will, with some misgivings, point to it from time to time as being a more vivid expression of an understanding of the world that also finds less vivid expression in the hemisphere hypothesis and in the efforts of various philosophers to put it in a more abstract form.

And there is another layer of meaning in the story: the dynamism of exchange between good and evil, the question of how close together they can become and how far apart they need to be.⁵ I will turn to that in the final chapter of Part III.

THE GENERATIVE POWER OF OPPOSITES

There is so much that is unusual, and unusually apt, in this myth of generation. Yet another element is the need for two creative forces that are seen by one of those forces (Flint) as opposed, but are brought to work together by the other (He Grasps the Sky With Both Hands). All things arise from opposing, but in some form nonetheless related, drives or forces. Energy is always characterised by the coming together of *apparent* opposites – apparent because this is how we have conceived things left hemisphere fashion: as in the positive and negative poles of an electric circuit, the north and south poles of the magnet, or, in a quite different sense, the merging of male and female gametes in the origin of new life. To the imaginative mind, such a coming together of ‘opposites’ is, as Niels Bohr (above) suggests, a sign that we are at last approaching a deeper level of truth.

Bohr’s greatest insight into the deep nature of the universe was that *contraria sunt complementa*: contraries *fulfil* one another. But it is also a timeless insight, to be found in one form or another in most ancient cultures of which I am aware. The most sophisticated of these, because of the detailed and refined exposition it has given rise to in China, is that of *yin* and *yang*, contrary forces that fulfil one another by their complementary nature (whose symbol, incidentally, Bohr placed at the centre of his coat of arms when ennobled by the Danish Government). And in that symbol the male and female principles are also implied. That the concepts may have become vulgarised is not a weakness in the concepts but, rather, in the cast of mind that does not measure up to them, much as a religion is not vitiated simply by the misguidedness of some of its followers. The idea of complementary opposites is, however, present at the beginning of the Western philosophical tradition, most notably in Heraclitus. And as Nietzsche says, ‘The world for ever needs the truth, hence the world for ever needs Heraclitus.’⁶

In one of his most penetrating observations, Heraclitus notes:

They do not understand how a thing agrees at variance with itself: it is an attunement turning back on itself, like that of the bow and the

lyre.⁷

It is the tension between the warring ends of the bow that gives the arrow the power to fly, as it is the tension in the strings of the lyre that gives rise to melody: this is what he meant by his saying ‘war is the father of all things’. What looks like a waste of effort – pulling in opposite directions – is the essence of generative vitality. The word translated here as attunement is *harmoniē*.⁸ Harmony is, after all, the reconciliation of things that contend with one another. According to Charles Kahn, Heraclitus’ most rewarding commentator, the word brings together three main ideas – the fitting together of surfaces that are ‘true’; the reconciling of warring parties; and the accord of musical strings.⁹ Whatever is, therefore, brings together elements that are made to fit, and in a manner that is fitting; draws peace out of conflict; and gives birth to beauty out of this reconciliation.

Another fragment is equally pregnant, and of even greater density:

Graspings: wholes and not wholes, convergent divergent, consonant dissonant, from all things one and from one thing all.¹⁰

(Incidentally, neither in this nor in the *harmoniē* fragment just quoted, does the word ‘thing’ occur in Greek: it is an interpolation that, significantly, the English language foists on the translator.)

The Greek word *syllapsies* – here translated ‘graspings’ – seems, again according to Kahn, to suggest several ideas: something ‘grasped’ (perhaps suggesting sudden comprehension); something that brings elements together; and fertility (Aristotle uses the word to mean the sexual generation of life). It is hard to overestimate the richness of this fragment. It says many things at once: that a deep understanding of the nature of reality comes in glimpses, or graspings – moments of insight; that, in that insight, all is neither simply single, nor simply manifold, neither simply whole, nor simply not whole, neither simply like nor simply unlike, each thing working with, and by the same token working against, the others; that the One and the Many bring one another forth into being, together *generating* the reality that has this structure at its core; and that despite (or, in light of all this, perhaps because of?) the nature of this multiplicity, all is held together in a *syllapsis*: the only word here not to be paired with an antithesis. And the

whole saying is in itself a *syllapsis* – a gathering which, in its fertility, births a *syllapsis* – a moment of dawning insight in us.

Much of what we know of Heraclitus' sayings comes in reports at second-hand, several of them from Plutarch. In one, Plutarch aims to clarify what Heraclitus is believed to have said:

According to Heraclitus one cannot step twice into the same river, nor can one grasp any mortal substance in a stable condition, but by the intensity and rapidity of change it scatters and again gathers. Or rather, *not again nor later but at the same time* it forms and dissolves, and approaches and departs.¹¹

Contemporary physics, as so often, confirms metaphysics. Thus, though it might be thought that a wave and a particle were mutually exclusive forms of manifestation – one possible at one moment, the other at another – light can be imaged as wave and particle simultaneously.¹²

This emphasis on simultaneity applies not just to individual experiences, but to whole categories of existence. Thus we are used to thinking of the individual and the general, the temporal and the eternal, the embodied and the disembodied as exclusive pairings; whereas they are not only inclusive, but – as it was possibly Goethe's greatest insight to see – are present *simultaneously* in one another. They are found, not by turning one's back on the supposed opposite, but by going more deeply into it. Thus the general is found *in* the individual, the eternal *in* the temporal, the spiritual *in* the embodied. This tension is creative, generative.¹³

A tension between opposites is at the heart of all creativity, not just in maths or science. For example, 'true poetry, complete poetry, consists in the harmony of contraries', wrote Victor Hugo: I will come to that shortly.¹⁴ 'Good poetry is usually written from a background of conflict', wrote William Empson, himself no mean poet and the author of *Seven Types of Ambiguity* – seven types, in other words, of creative tension.¹⁵ Donne, whose poetry delights in ambiguities and paradoxes, warned his friend Sir Henry Wotton that paradoxes are generative. 'They are nothings', he wrote, in a spirit of deliberate paradox, 'therefore take heed of allowing any of them least you make another'.¹⁶

Nothings, then, that *breed* – anticipating a richly suggestive paradox of Heidegger's: '*das Nichts selbst nichtet*'. In my view, the tetchy responses of analytic philosophers to Heidegger's words merely advertise their own limited thinking.¹⁷

The phrase is from Heidegger's 'Was ist Metaphysik?' a lecture delivered in 1929; it is sometimes translated as 'nothing noths'. There is no such verb in English, of course, but there was no such verb as *nichten* in German, either, until Heidegger decided to employ it. The phrase is notoriously difficult, but one way of understanding it that makes sense to me is this. Nothing, like Being, is no thing. Neither is it the mere *absence* of a thing: it is a subject of action, Heidegger implies (it positively 'noths'). There is nothing to which we can in any way liken nothing, but if there were anything, it would be, like Being, a process (in this case, a process of negation, whereas Being is a process of affirmation). Hence the formation of a verb from what looks like a noun. Nothing is not just some thing that fails to presence – an absence – but a certain irreducible element in whatever exists, on a par with, and complementary to, Being itself; not passive and sterile, but having energy of its own that takes part in the coming into being of whatever is. It is not an 'end', in the sense of the necessarily vacant termination of a linear process, but the other and necessary 'end' of the dipole that is Nothing and Being together.

If before there was Being there was Nothing, nothing could no longer be thought of as merely the *absence of something else*, because that implies, precisely, a something else: something outside itself to ground it, and there *was* no something else. Nothing can only ground itself in itself. It therefore fulfils itself through its noth-ing – the noth-ing of no-thing (as in Heidegger's 'nothing noths'), a self-denial: *das Nichts selbst nichtet* – nothing noths *itself*. (In Chapter 28 I will look at a creation myth that expresses this self-denial in an astonishingly vivid way.)¹⁸ A negative x a positive just leads to another negative; but a negative x a negative leads to a positive. And so it is that Being begins to become.

Can anything co-exist with its *negation*? In Chapter 16 we saw that zero was first conceived by Brahmagupta in precisely this fashion: zero was a particular kind of coincidence of opposites, the presence of zero was the presence of x combined with the presence of its negative, -x. Notice also, at the *next* level, that zero's being a presence does not stop it being an absence; each is a different way of understanding the same element. Being

and non-being coincide. As Hegel puts it, ‘Being and nothing are the same; *but just because they are the same they are no longer being and nothing*, but now have a different significance’.¹⁹

Notice that they have been taken up into a synthesis that is doubly generative: not just of a new whole, which is what one sees at first; but of a transformation, for that very reason, of the elements that had gone to form the new synthesis. The process is reverberative between the ‘parts’ and the whole.

Although a thing and its opposite, or a thing and its negative, are customarily thought of as separate warring entities, they are mutually sustaining, inseparable, and intertwined. You cannot have heat without cold, or brightness without darkness. As Alan Watts pointed out, we often appear to believe we can keep the mountains and get rid of the valleys.²⁰ The opposite ends of a simple stick have to be present, not just at the same time, but as part of the same single phenomenon: a stick. A road must at the same time be the road up and the road down. Just as the road that is a road up is necessarily a road down, everything looks different depending on our viewpoint. A river changes, and in so doing remains the same. A boundary can become the pivotal point of connexion (since boundaries are necessary to give identity, and thereby to make *connexion* possible at all); or it can become the point of separation, where there is no longer reciprocal influence and interaction. It is equally one and the other: now you see it, now you don’t. And depending on your attention you may help to *make* it one or the other. We have one such enigma at the core of our being, the corpus callosum: in connecting it separates, and in separating it connects. As if being intuitively aware of this, in the Upanishads it is written: ‘In the space within the heart lies the controller of all ... He is the *bridge* that serves as the boundary to keep the different worlds *apart*.’²¹

The inhibitory action of the corpus callosum enables the human condition. Delimitation is what makes something exist. Friction, for example, the very constraint on movement, is also what makes movement possible at all. In its excess, true, we are immobilised; yet so we are in its absence. There is nothing to push against. Resistance can put the brakes on motion, or cause motion; it can prevent or cause change. It presents us with an obstacle, and thereby forces us to shift our point of view; it helps us shift the plane of focus, so that we see something new. In itself, resistance is neither necessarily good nor necessarily bad – just necessary.

Hegel was, in my experience, right to hold that

antinomies ... appear in all objects of every kind, in all conceptions, notions and Ideas ... every actual thing involves a coexistence of opposed elements. Consequently to know, or, in other words, to comprehend an object is equivalent to being conscious of it as a concrete unity of opposed determinations. The old [Western] metaphysic, as we have already seen, when it studied the objects of which it sought a metaphysical knowledge, went to work by applying categories *abstractly* and *to the exclusion of their opposites*.²²

The word ‘abstractly’ here could best be read as ‘left hemisphere fashion’; hence naturally leading to the exclusion of opposites.²³ With this insight of Hegel’s, Western philosophy caught up at last (both clumsily and belatedly) with what Heraclitus had already seen in the 6th century BC, and Taoism had been teaching for two thousand years.

For opposites to co-exist, they clearly cannot cancel or annul one another, but must rather give rise to something new: a form of *harmoniē*, as in Heraclitus’ lyre. But note that this harmony is not to be taken merely in the ordinary musical sense of concord, but in the sense of *tonos*, tautness, from which we get our word ‘tone’. If the opposing forces in lyre or bow simply annulled one another, the string would go slack – no *tonus* – and nothing, no flight of notes, no arrow’s flight – could come from either. This is also, by the way, what is intended by the Golden Mean: not a flabby compromise, but a position in which taut synergy produces a dynamic equipoise. For a good apple pie you need both tart apples and honey, both sourness and sweetness, not just apples that are bland.

Those people in whom balance is achieved merely by ‘toning down to an unattractive equilibrium’ are very different from those who achieve a living harmony, writes Schleiermacher:

For this frequent phenomenon which so many value highly, we are not indebted to a living union of both impulses, but both are distorted and smoothed away to a dull mediocrity in which no excess appears, because all fresh life is wanting. This is the position

to which a false discretion seeks to bring the younger generation ...
Elements so separated or so reduced to equilibrium would disclose
little even to men of deep insight ...²⁴

We often represent the Golden Mean as a midpoint on an adynamic line, a position that understandably does not appeal to some people, especially perhaps the young, because they are still orienting themselves in the world by opposition to something. We must see the truth embodied in Heraclitus' image of the bow or lyre. William Blake wrote: 'Without contraries is no progression. Attraction and repulsion, reason and energy, love and hate, are necessary to human existence.' But he also wrote: 'There is a Negation, & there is a Contrary: The Negation must be destroyd to redeem the Contraries.' Negation here means what I would call annulment: it must be replaced by the energy of contraries, *neither* of which should be annulled, but both of which should be, by contrast, maximally present.

CONTRARY TO REASON?

The word ‘coincidence’ has fallen on hard times. ‘What a coincidence!’ we say when we meet someone who drives the same make and model of car. This is one reason I use the words *coincidentia oppositorum* in preference: the Latin phrase is owed to the fifteenth-century polymath Nicholas of Cusa, and I will come back to his use of it in a later chapter. It was later popularised through the work of Jung. What I want to emphasise for now is that ‘coincide’ here means more than that opposites happen to look like one another, even to cohere, to concur, or to be in accord, though those meanings are present, too: it means that they ‘fall together’, like the superposition of two images which, when projected on a screen, overlap precisely to form a new image. That they can do so is not contrary to reason, though according to a narrow logic a thing and its opposite cannot both be true: in the machine sense it ‘does not compute’.

Fortunately we understand far more than any machine (however much information it might hold) ever could. The presence or absence of contradiction, as the great mathematician Pascal said, is no basis on which to judge truth.²⁵ Kant, who synthesised rationalism and empiricism, was compelled to accept that there are important antinomies – that is to say, contradictory conclusions each of which seems an inevitable inference from logic and reason.²⁶ His four antinomies concern the infinity or otherwise of space and time; the existence or not of parts and wholes; the existence or otherwise of causal determinism; and the existence or not of a necessary being. These antinomies, if, as Kant believed, they are irresolvable, strike at the very root of any philosophical belief in a world that is both rational and mind-independent. However, another way of looking at antinomies is exemplified in the work of the philosopher and theologian Sergei Bulgakov, who does not see a problem so much as an insight. As he put it in his book *Unfading Light*: ‘Antinomy does not imply a mistake in reasoning or the overall falsity of a given epistemological misconception, which can be clarified and thus eliminated. Entirely legitimate antinomies are inherent to reason.’²⁷

Bulgakov was thinking of the realm of the infinite, a topic I approached in Chapter 16. But even in the finite realm, as Bergson points out, concepts

‘generally go in couples and represent two contraries’. He is thinking of, to take a basic example, the way a tree is represented by science as it were from without, and the experience of the tree from within consciousness: the two coincide – overlap on the screen – perfectly, like your face superimposed on a radiograph of your skull, but mean quite different things:

There is hardly any concrete reality which cannot be observed from two opposing standpoints, which cannot consequently be subsumed under two antagonistic concepts. Hence a thesis and an antithesis which we endeavour in vain to reconcile logically, for the very simple reason that it is impossible with concepts and observations taken from *outside* points of view to make a thing. But from the object, seized by intuition, we pass easily in many cases to the two contrary concepts; and as in that way thesis and antithesis can be seen to spring from reality, we grasp at the same time how it is that the two are opposed *and* how they are reconciled.²⁸

Note we can begin with the description in terms of physics, but could never progress from that to the experiential tree; whereas we can begin with the experience and later incorporate within it the physics. The right hemisphere can incorporate the left’s take, but the left cannot incorporate that of the right. The mechanistic vision can come only from experience, even if it is an experience from which much has been excluded; the experience of the tree can never emerge from the mechanistic vision.

On top of this, there is the reality that, from any one standpoint, only a partial vision is possible. The opposition of ‘standpoints’ is a way of speaking of difference wrought by context. As Whitehead put it, ‘there are no whole truths; all truths are half-truths. It is trying to treat them as whole truths that plays the devil’.²⁹ Each truth conceals another, opposing, truth, that becomes apparent as soon as we move from the abstract to a real world context. Moreover we need *both* the vision that reveals separation *and* the vision that reveals union. According to the twentieth-century Zen master Shunryū Suzuki: ‘We have to understand things in two ways. One way is to understand things as interrelated. The other way is to understand ourselves as quite independent from everything.’³⁰ Once again Whitehead comes to mind: ‘To have seen it from one side only is not to have seen it.’³¹

The problem arises when we are so anxious to avoid contradiction that we are tempted to dismiss, or ‘prove’ to be wrong, one of the alternatives, both of which are needed. Many contemporary scientists and most analytic philosophers (it is intrinsic to their philosophical *credo*) are in servitude to this ‘either/or’ cast of mind. Alfred Kazin wrote that we should

trust to the contradictions and see them *out*. Never annul one force to give supremacy to another. The contradiction itself *is* the reality in all its manifoldness ... the more faithful [man] is to his perception of the contradiction, the more he is open to what there is for him to know ... a contradiction that is *faced* leads to true knowledge.³²

In a similar vein, Jacob Needleman wrote: ‘Stay with the contradiction. If you stay, you will see that there is always something more than two opposing truths. The whole truth always includes a third part, which is the reconciliation’.³³

Opposites genuinely *coincide while remaining opposites*. Some philosophies tend to collapse into the monism that opposites are identical; others into the dualism that opposites remain irreconcilable and are merely, at most, juxtaposed.³⁴ The important perception is that opposites not only co-exist, but give rise to and fulfil one another (*‘sunt complementa’*), and are conjoined (like the poles of a magnet) without any intervening boundary, while nonetheless remaining distinct as opposites. And indeed the more intimately they are united, the more, not the less, they are differentiated.

THE CIRCULAR DIALOGUE OF LOVE WITH STRIFE

What we get when we become unaware of the neglected – that is to say, opposing – truths inherent in our position is extremism. We yield power to the dark side by ignoring it: by acknowledging it we free ourselves from its stranglehold.

It was the painter and architect Friedensreich Hundertwasser's view that 'the straight line leads to the downfall of mankind'.³⁵ This was not an idle reflection. He returned to it with a vengeance in 1985:

In 1953 I realized that the straight line leads to the downfall of mankind. But the straight line has become an absolute tyranny. The straight line is something cowardly drawn with a rule, without thought or feeling; it is a line which does not exist in nature. And that line is the rotten foundation of our doomed civilization ... The straight line is atheistic and immoral. The straight line is the only sterile line, the only line which does not suit man as the image of God. The straight line is the forbidden fruit. The straight line is the curse of our civilization. Any design undertaken with the straight line will be stillborn. Today we are witnessing the triumph of rationalist know-how and yet, at the same time, we find ourselves confronted with emptiness. An aesthetic void, desert of uniformity, criminal sterility, loss of creative power. Even creativity is prefabricated. We have become impotent. We are no longer able to create. That is our real illiteracy.³⁶

No longer able to create: like Flint, with his trusty arrow.

Heraclitus' (considerably younger) contemporary Empedocles thought there were two opposing and equal forces, love (φιλότης) and strife (νεῖκος); in the presence of love only, or strife only, nothing could exist. These forces for union and for division, according to Empedocles, are present in the very stuff of all things, not just in their ultimate origin. And they are imaged as a circle, not a straight line.

Life is, after all, a dance to be celebrated, not a series of equations to be solved. And the dance, whatever may have evolved from it since, originated

as a circle, based on a dipole that is not – and must never become – an opposition, but complementary, an act of consummation: that of man and woman. The circle represents both the finite and the eternal, since it has no end; it also represents that which moves and stays still. So Empedocles wrote:

Thus insofar as they have learned to grow as one out of many,
And inversely, the one separating again, they end up being many,
To that extent they become, and they do not have a steadfast
lifetime;
But insofar as they incessantly exchange their places continually,
To that extent they always are, immobile in a circle.³⁷

Yet linearity and circularity can co-exist, if what looks like a circle from this point of view is actually a spiral, like an endless coiled spring viewed down its axis.

The idea of *complementarity* is foundational in Nature. So, for example, to turn one's back on the parts (the workings of the left hemisphere) and accept only the whole (the work of the right hemisphere) is not to 'get back to wholeness', because the whole is never an annihilation, but rather a subsumption, of the parts. The true whole exists precisely in this relationship, the tension between parts and an apparent whole. You recognise the earth's true essence, writes Schelling,

only in the bond by virtue of which it eternally asserts its unity as the multiplicity of its things and, conversely, asserts this multiplicity as its unity. And it's not that you think that, apart from this infinity of things to be found in this earth, there is another one, which is the unity of these things; rather *the same* that is the multiplicity is also the unity, and *the same* that is the unity is also the multiplicity, and this necessary and indissoluble One of unity and multiplicity is in itself what you call its existence ... Existence is the conjunction of a being as One, with itself as a Many.³⁸

The conjunction of the One and the Many is so important that it merits consideration in greater detail in the next chapter. It parallels that very

necessary synthesis which is performed by the right hemisphere (if it is given freedom to do so) of its own awareness of wholeness together with the work of division which is provided by the left hemisphere. This is a synthesis that results in a new and enriched whole. Although it may sound as if this process is a linear sequence, it is in fact a continuous, reciprocal and immediate exchange, giving rise to a simultaneous fusion, yet always requiring the right hemisphere to oversee the process. This depends of course on the interhemispheric relationship functioning properly – and on Flint remaining under the superintendence of his brother.

Oppositions are the ground of energy, if properly seen, as in the tautness of the bowstring: the primal form of opposition is that between two opposed tendencies, one for division (strife) and one for union (love). Civilisations also flourish when they remember this, and fail when they forget. One of the strands of thought that flowed into and made the world view of the Renaissance so rich was the Kabbalah, a discovery of the humanists, spearheaded by the young polymathic scholar Giovanni Pico della Mirandola; and with it, the *coincidentia oppositorum* became almost an axiom of Renaissance thought, literature and art, imaginatively leavening the linear logic that had so deadened mediaeval scholasticism.

In the Kabbalah, the structure of human faculties takes the form of a tree with a right-hand side and a left-hand side; humanity's task is to integrate them, both laterally and vertically.³⁹ Specifically it is held that the mind is made up of two faculties: wisdom (*chochmah*) on the right, which receives the *Gestalt* of situations in a single flash, and understanding (*binah*), opposite it on the left, which builds them up in a replicable, step-by-step way. *Chochmah* and *binah* are considered 'two friends who never part', because you cannot have one without the other. *Chochmah* gives rise to a force for loving fusion with the other, while *binah* gives rise to judgment, which is responsible for setting boundaries and limits.⁴⁰ Their integration is another faculty called *da'at*, which is a bit like Aristotle's *phronesis*, or even *sophia* – an embodied, overarching, intuitive capacity to know what the situation calls for and to do it. What is more this tree is a true organism, each 'part' reflected in, and qualified by co-presence with, each of the others.

Schleiermacher thought that, inasmuch as the business of the cosmos is the differentiation of unity, every phenomenon comes from the working together of two opposing tendencies. Each of these emanations of the

cosmos ‘can only be actualized in two hostile yet twin forms, one of which cannot exist except by means of the other’. This includes the human soul, which, ‘as is shown both by its passing actions and its inward characteristics, has its existence chiefly in two opposing impulses’. One impulse was towards individuation of the self, the other towards surrender of the self to union with the whole. He thought that different beings found different points along this continuum, so that ‘the perfection of the living world consists in this, that between these opposite ends all combinations are actually present in humanity.’ Yet, he asked, ‘how are these extremes to be brought together, and the long series be made into a closed ring, the symbol of eternity and completeness?’ ⁴¹

Empedocles had taught that these two tendencies did form an endless *ring* of creation, as we have seen: ‘Twofold is what I shall say: for at one time [the elements] grow to be only one out of many, at another time again they separate to be many out of one.’⁴² What is united is to be divided, what divided to be united. The process involves cyclical returns. It follows from this cyclical nature that if you go far enough in any one direction you reach not more of what you desired but its opposite: go East and you eventually reach the West. And it follows that both of two opposites are simultaneously present, and need to be so, just as East and West are simultaneously present on the compass and need to be so, not just to navigate the world, but to have a world to navigate.

The discussion of the coincidence of opposites has so far been metaphysical, and may for that reason have seemed somewhat remote from daily life. But if I am right that this principle is generative of reality, it will also be generative as much at the level of everyday experience, both physical and mental. Let us turn for a moment to look at just such phenomena, beginning with the more physical, and moving on to the more psychical.

HORMESIS: UNEXPECTED CONSEQUENCES

Scientists involved in the Biosphere 2 project, which created the largest enclosed ecological system on earth, were puzzled by the fact that trees within the project repeatedly failed to achieve maturity before they fell over. Later, they realised that trees needed wind in order to grow strong. Exposure to winds causes the growth of ‘stress wood’, which is the core of the tree’s strength and integrity. Winds also cause the root system to strengthen. Nietzsche got there before them, and immediately relates it to spiritual growth:

Examine the lives of the best and most fruitful people and peoples and ask yourselves whether a tree which is supposed to grow to a proud height could do without bad weather and storms; whether misfortune and external resistance, whether any kinds of hatred, jealousy, stubbornness, mistrust, hardness, greed, and violence do not belong to the *favourable* conditions without which any great growth even of virtue is scarcely possible? ⁴³

In a similar physical phenomenon, repeated stress increases bone density and strength, and while excess stress can of course be damaging, too little is also harmful: the ‘microgravity’ environment in which astronauts operate would quickly lead to osteoporosis were steps not taken deliberately to counter the effect.

The name hormesis has been given to the phenomenon whereby a substance or process that is damaging to an organism above a certain level may have an opposite effect at lower levels. This reflects Paracelsus’s dictum that all substances are poisons, depending only on the dose. Many notoriously poisonous plants may be medicinal in low doses: digitalis, a highly toxic extract of foxglove, has been used to treat heart failure since the eighteenth century; atropine, an extract of deadly nightshade, is a treatment for a seriously debilitating nervous disease, myasthenia gravis; arsenic has been used with some success to treat a host of illnesses for over two thousand years, and is still used in the treatment of syphilis and cancer.

Hormesis was first noted with respect to radiation, where the results can be dramatically opposed to one another. While radiation was clearly known to be a cause of cancer, it turned out that extremely low doses could stimulate DNA repair and delay cancer in laboratory animals.⁴⁴ Consonant findings have been found in humans, with very low exposure being superior to no exposure.⁴⁵ Some living organisms, including bacteria and plants, cannot grow without background-level radiation.⁴⁶ A review of the literature on radiation hormesis in 2019 concluded that ‘practically all immune parameters are beneficially influenced by all forms of low-dose radiations.’⁴⁷

The effect also applies to toxic chemicals in small amounts. Insecticides have been shown to stimulate growth of insects as well as plants, and fungicides can stimulate growth of fungi; low-level exposure to a stress agent that is harmful at higher levels can extend life in mice and fruit flies.⁴⁸ Dioxins are very widely known to be highly toxic, but have been shown in animal experiments at low doses to protect against liver tumours in rats.⁴⁹ Similar findings concerning dioxins have been confirmed in humans.⁵⁰ ‘Hormesis’, according to one group of experts, ‘is *fundamental to evolution and highly generalizable*.’⁵¹

(I ought perhaps to emphasise that none of this should, of course, be interpreted under any circumstances as a reason not to be extremely watchful about pollution of the environment by radiation and chemicals. The point I am making *depends* on the indisputably toxic nature of the agents at anything other than minimal levels.)

In a more homely context, either complete physical inactivity or bouts of strenuous exercise increase the risk of infection, while moderate exercise strengthens the immune response.⁵² Architects are now being asked to make designed environments somewhat more *difficult* to move around in the interests of human health. As Coleridge noted, ‘the thing that causes instability in a particular state, of itself causes *stability* – as for instance wet soap slips off the ledge, detain it till it dries a little & it *sticks*’.⁵³

Naseem Nicholas Taleb’s book *Antifragile* is an exploration of the many ways in which by seeking to make a system less vulnerable, we succeed only in making it more so.⁵⁴ The mistake, he suggests, is that we seek to make it ‘robust’ and thereby inflexible; this leaves it open to catastrophic collapse under certain, non-vanishingly rare, circumstances. His message is

that we should rather seek to make it ‘antifragile’, which paradoxically includes allowing certain vulnerabilities that make it capable of withstanding large shocks. Manageable small setbacks enable the whole to adapt, endure and evolve. Dinosaurs were robust, but when the right (or wrong) set of circumstances prevailed, they were doomed. The *locus classicus* is that of a type of forestry management so successful in avoiding small fires that the forest is vulnerable to total destruction in the (ultimately inevitable) event of a fire: in the natural course of things small-scale fires create firebreaks that, though they may locally appear to be a weakness, protect the future of the whole.

Turning to the more intangible realm of morality and human flourishing, we find the structure similar. Nothing good is achieved without a degree of adversity being overcome: health, resilience, courage, skill, knowledge, virtue and wisdom are no exceptions. As Seneca is famed to have put it, ‘a gem stone is not polished without friction, nor is a man without adversities’. It seems rational to strive to make life easy, to minimise effort: yet exerting oneself in a cause, neglecting one’s ease for the sake of others, finding solutions to difficult problems, and overcoming resistance, all make for fulfilment, while a goal that is too easily achieved fails to satisfy; and what we come by too easily may lack meaning or value. In the words of the Midrash, ‘one thing acquired through pain is better for man than one hundred things easily acquired.’⁵⁵

FURTHER PROBLEMS WITH LINEAR THOUGHT

In Chapter 15, I reminded the reader of the Red Queen's advice to Alice. Given the circle of love and strife, the further we push single-mindedly in one direction, the more we achieve its opposite. Quoting Cicero, Hegel wrote: '*Summum jus summa injuria* [the extreme of the law is extreme injustice] which means that to drive an abstract right to its extremity is to do a wrong':

In political life, as every one knows, extreme anarchy and extreme despotism naturally lead to one another. The perception of dialectic in the province of individual ethics is seen in the well-known adages: 'Pride comes before a fall'; 'Too much wit outwits itself'. Even feeling, bodily as well as mental, has its dialectic. Everyone knows how the extremes of pain and pleasure pass into each other: the heart overflowing with joy seeks relief in tears, and the deepest melancholy will at times betray its presence by a smile.⁵⁶

A principle that is extended too far, without respect to the opposite that is always inherent in it, may turn into the very thing that is not only undesired, but is being denied. This is an understanding we would appear to have lost almost completely, and which, if we had kept it in mind, might have preserved us from many of the worst follies of contemporary culture.

In order to be natural, we must not try to be so; if we wish happiness, it is fatal to pursue it; freedom requires self-discipline; sometimes we must be cruel to be kind. Fear of pain leads to pain and fear: as Montaigne pointed out, 'anyone who is afraid of suffering suffers already of being afraid'.⁵⁷ So that they may be impervious to indoctrination, children must be indoctrinated in the principles of reason. If you want peace, you must prepare for war; to achieve freedom, you must bind it by laws; yet laws blindly applied or enforced with excessive zeal are a common source of injustice.⁵⁸ To which one well might add, as William James points out, that 'most human institutions, by the purely technical and professional manner in which they come to be administered, end by becoming obstacles to the very purposes which their founders had in view.'⁵⁹

On another level altogether, if depression does not destroy you, it can be a positive experience – one, as I too readily understand, associated with much suffering, but nonetheless positive in what it reveals to the sufferer. The poet William Blake, who said that ‘without contraries there can be no progression’, even thought that there must be sorrow in heaven if there was to be joy.⁶⁰ He also wrote:

It is right it should be so;
Man was made for Joy & Woe ...
Joy & Woe are woven fine,
A Clothing for the Soul divine;
Under every grief & pine,
Runs a joy with silken twine.⁶¹

The imagination thrives on the implicit, and is deadened by the explicit. The explicit is single: the implicit is a coming together of opposites, and requires the simultaneous presence and absence of whatever is being gestured towards. We may become more aware of something if it is partially eclipsed, while a pure manifestation would not have achieved its end. If you are making a film, and wish to evoke the stillness of a warm day in the country, do you leave the soundtrack completely blank? No, you introduce the faint and intermittent buzzing of a fly. In an interior scene of tranquillity, the faint, slow, deep tick-tock of a grandfather clock intensifies both the peace and, as may seem oddly, the sense that time has come to a standstill. When the top of a mountain is hidden in cloud we appreciate its full immensity better than when the whole is in view. Limitation can intensify the sense of infinity. One of the best known poems in the Italian language is Leopardi’s ‘*L’infinito*’, in which he describes how a break of trees that partly obscures the view of an open landscape floods his mind with the sense of the infinite, and the stirring of the branches enhances the sense of stillness:

Always dear to me has been this lonely hill,
and this line of trees which, from so much
of the furthest horizon, hides my view.
Yet as I sit and gaze, in my thoughts

I conjure up boundless spaces far beyond it,
and superhuman silences,
and deepest quiet – until my heart
almost grows afraid. And as I hear the wind push
Through the trees, I cannot help setting its sound against
that infinite silence; and the eternal envelops me
with the thought of seasons long past
and of the living present and all its sounds.
Then in this immensity my thought goes under,
And sweet it is to me to drown in such a sea.⁶²

Pursuing something, then, can, for better or worse, lead to an outcome that seems paradoxical: we achieve the opposite. But we are also very often required to embrace opposites *at the same time*: as Kazin put it, ‘The contradiction itself is the reality in all its manifoldness’. So Empson wrote: ‘Extremely often, in dealing with the world, one arrives at two ideas or ways of dealing with things which both work and *are needed*, but which entirely contradict one another.’⁶³ We all experience this at every level from the most innocently trivial-seeming to the most sublime. We need universality and particularity, precision and flexibility, restriction and openness, freedom and constraint – simultaneously. Everything flows from the pairing. We ‘lose ourselves’, and consequently find ourselves, in music, dance, or contemplation of a beautiful painting or landscape.

However we look at it, the world forces us to acknowledge that opposites require to be satisfied together: no single goal can be successfully pursued without due acknowledgment, and indeed acceptance of, its contrary. To quote James again:

Somehow life does, out of its total resources, find ways of satisfying opposites at once. This is precisely the paradoxical aspect which much of our civilization presents ... the way to certainty lies through radical doubt; virtue signifies not innocence but the knowledge of sin and its overcoming; by obeying nature, we command her, etc. The ethical and the religious life are full of such contradictions held in solution. You hate your enemy?—well, forgive him, and thereby heap coals of fire on his head; to realize

yourself, renounce yourself; to save your soul, first lose it; in short, die to live. ⁶⁴

I have referred earlier to an innocence the other side of experience, a knowledge the other side of unknowing, a wisdom the other side of folly. ‘The only simplicity for which I would give a straw’, said the rather down-to-earth jurist, Oliver Wendell Holmes, ‘is that which is on the other side of the complex – not that which never has divined it.’⁶⁵ Joseph Campbell writes:

I think there are three states of being. One is the innocent expression of Nature. Another is when you pause, analyse, think about it ... Then, having analysed, there comes a state in which you’re able to live as Nature again, but with more competence, more control, more flexibility.’⁶⁶

This, I believe, reflects the proper reciprocal functioning of the two brain hemispheres.

In this sense, once more, the worse it gets, the better it gets. According to Jung,

The grand plan on which the unconscious life of the psyche is constructed is so inaccessible to our understanding that we can never know what evil may not be necessary in order to produce good by enantiodromia, and what good may very possibly lead to evil.⁶⁷

Enantiodromia means literally ‘running in opposite directions’; Jung used the word to refer to the emergence, in the course of time, of the neglected opposite, the one of which we are unconscious. History is littered with examples of (at the time apparently) good actions that gave rise to ill effects, and (at the time apparently) disastrous events that yielded positive results. An instance: the elimination of wolves, the top predator in the ecosystem of Yellowstone Park in the 1930s, so unbalanced it that widespread destruction of the ecosystem ensued. Their reintroduction about 25 years ago has resulted in a tripling of the number of elk, their main prey;

the sudden flourishing of the trees and shrubs that the elk ate (they formerly did not have to keep on the move and destroyed their own habitat); the return of beavers which used to be plentiful, but need willow trees to flourish; and the advance of many other species in what is called a 'trophic cascade'.⁶⁸ Nature testifies everywhere to enantiodromia.

Max Scheler wrote that 'it is originally our suffering of the resistance of the world to our vital drive impulses ... which sets everything going for us, including the very fact that one can be conscious of anything ... Everything stems from this original resistance, and the original subjective experience of suffering.'⁶⁹ This creative aspect of resistance is one to which I will need to return more than once. William James made a distinction between what he called the once-born, those who are naturally uncomplicatedly happy, and the twice-born, those who attain happiness only through enduring and surviving a state of abject misery. And he described the transformation of Tolstoy – a twice-born, if ever there was one – like this: 'The process is one of redemption, not of mere reversion to natural health, and the sufferer, when saved, is saved by what seems to him a second birth, a deeper kind of conscious being than he could enjoy before.'⁷⁰ Having suffered along the way *deepens* in some sense the experience. Viktor Frankl, who himself survived, and reflected on those who, like him, had survived, the death camps of the Nazis, recognised that suffering deepens meaning in life. In this sense, suffering is, obscurely, desirable, and yet absolutely not to be desired. *Contraria sunt complementa*.

THE ASYMMETRY OF THE *COINCIDENTIA OPPOSITORUM*

In the physics that makes the world possible, chaos and rigidity must be very finely balanced.⁷¹ We need forces for stasis and conservation, and forces for flow and change: but they must work together. We can see this being played out in the task of balancing inherently contradictory or paradoxical elements such as being both united *and* distinct in spatial terms as well as both stable *and* changeable in temporal terms. However, as elsewhere, there is an asymmetry between the forces for division and the forces for union: ultimately they have to be united, not remain divided. The brothers must work together, as He Grasps the Sky With Both Hands sees, not against one another as Flint intends.

Actual occurrence involves the breaking of what is, considered in the abstract, symmetrical.⁷² Small imbalances, differences among sameness, at all levels in nature make it work, starting with the initial inequality of matter and antimatter. The physicist Pierre Curie wrote in 1894 that

... certain elements of symmetry may coexist with certain phenomena, but they are not necessary. What is necessary is that certain elements of symmetry do *not* exist. *It is asymmetry which creates the phenomenon* ... The effects produced may be more symmetrical than the causes.⁷³

(I will discuss asymmetry in the cosmos further in Chapter 24.) The principle for division and the principle for union need to be brought together, not divided. We need not *either* both/and *or* either/or, but *both* both/and *and* either/or.⁷⁴ We need not non-duality only, but the non-duality of duality and non-duality.

This is wittily encapsulated in a story I heard told by Rabbi Jonathan Sacks. A faithful man finds in the scriptures that Rabbi X said that a certain thing was true. Later he finds that Rabbi Y said that the very same thing was false. He prays for guidance: ‘Who is right?’ God answers: ‘Both of them are right.’ Perplexed, the man replies: ‘But what do you mean? Surely they can’t *both* be right?’ To which God replies: ‘All three of you are right.’⁷⁵

In terms of the hemispheres it is once more not a symmetrical, but an asymmetrical, arrangement: not just between two dispositions (that of the left hemisphere and that of the right) towards the world, but between a disposition (that of the left) that sees the two dispositions as an antagonism that must ultimately lead to the triumph of one and the annihilation of the other, and a disposition (that of the right) that sees they need to be preserved together, neither being allowed to extinguish the other – *even though they are not of equal value*. One – the disposition of the right – overarches and take into account the other; much as He Grasps the Sky With Both Hands not just protects Flint, but enables the fulfilment of Flint's contribution.

Here I want to turn to the remarkable book *Physical Spirituality: Changing the Paradigm* by Mike Abramowitz, a writer who approaches philosophical issues from a background in physics.⁷⁶ I can deal here only partially with the hypothesis of his book, but amongst many points of interest he contrasts what he calls 'architective' with 'connective' interactions in physics.

Architective interactions use bonds to create persistent objects by disjunctive transformations: such are the chemical bonds that define molecular geometry. They are competitive for outcome, and result in something disappearing and something else taking its place: 'losing a contest is catastrophic for a bond'. Bonds are stable and resist change; but when they are forced to change, they do so 'stepping from one static architecture to another and in sequences of discrete reconfiguration events'. (They are characterised, in other words, by what I call 'stickiness', a core feature of the left hemisphere's take on the world.) Connective interactions, by contrast, allow the merging of entities, and are infinitely resolvable – waves being an example – where architectives are not. Connectives are 'fluid, highly susceptible to change, and do so in a smooth, unstepped motion.'

Architectivity and connectivity have a creative oppositional relationship. Architectivity constrains connectivity, but not vice versa. Yet 'architectivity attains its cosmic significance as a *contributor to the connectivity* of the cosmos rather than through its compulsive attempts to constrain connectivity.' At every scale, 'connectivity plays with whatever objects architectivity provides.' I cannot help seeing a similarity here with Whitehead's idea that potential 'plays with' – further creates by responding positively to – whatever it is that actualisation provides.

Architectivity is characterised by the fact that the motions of its constituent objects are always constrained, though due to this very fact their identity endures – or, equally, may be obliterated. None of this is true of connectivity. Architective aggregates exclude one another, can be defined and categorised with precision, display fixed hierarchies of rank, and can exercise precise control – in all of which respects, again, they form a contrast with connectives.

It will not have escaped the reader that there are clear parallels between what Abramowitz calls architectivity and the left hemisphere *modus operandi*, and what he calls connectivity and the right hemisphere *modus operandi*; and, moreover, with the idea that what the left hemisphere makes static and differentiated is taken up again into the right hemisphere's understanding of a living whole. I suspect that architectivity and connectivity reflect in their different ways, the same underlying structure. Both are necessary for creation.

Abramowitz also sees these patterns reflected, as do I, in the human world. Contemporary Western assumptions about reality are drawn, he says, from architectivity – for example,

we unquestioningly accept that stasis is the natural 'rest state' of physical phenomena and that movement only arises when energy is imparted to an object that is otherwise naturally at rest.

But this, he argues, is at the very least an unwarranted assumption and may be profoundly misleading:

a state of motion is at least equally entitled to being considered the natural state of things, one in which stasis only arises when constraints are imposed on objects that are naturally in motion.

Indeed: the evidence suggests a state of motion is more than equally entitled to be considered the 'natural' state.

More broadly, he writes that 'our cultures, history and traditions have been overwhelmingly shaped by an architectival dominion'.⁷⁷ Cultures tend to accumulate architectival knowledge, since it is the kind that can be

precisely codified and stored, faithfully passed from generation to generation, built on and accumulated; while connective skills are not easily codified or handed down ... a personal lifetime of connective *nous* is usually buried with the individual.

Given this view, it is not surprising that he also contrasts ‘purely connective religion’ which tends to be fugitive, having less impressive power, but which has great spiritual depth – he mentions Sufism, Zen Buddhism, the Kabbalah, Tantric Hinduism and Christian mysticism – with architectonic religions possessed of dogmas, dominated by literalism, and enshrined in hierarchical structures. ‘Rather’, he writes, ‘connective religions’

see the parental myths as allegories pointing to a secret that is not knowable in any dogmatic sense and so must be alluded to by parable. This secret knowledge can only be attained by direct engagement with their spirits, so all indirect representations of them, including any iconic and dogmatic representations, even those of their parent religions, are considered to be a barrier to their direct revelation.

I have adverted to Abramowitz’s intriguing insights into ‘physical spirituality’ not just because of the striking parallels with the hemisphere hypothesis – there are more that I have not had time to explore here – but because of his interesting perception that the balance between the two forces he describes depends on scale, in three respects.

First, bonds occur on a small scale, ‘appear to become scarce at larger scales, and absent at very large scales. Connective interaction, on the other hand, is observable in abundance at every known scale.’ Additionally, interactions based on physical shape, which is architectonic in nature, appear to be ‘restricted to a window of scale residing between the molecular and the planetary ... It is not unreasonable to propose a window at a cosmic scale larger than the planetary in which all interaction is connective.’

Second, although the connective spirit is manifest everywhere, ‘its influence is comparatively small, especially inside pockets of architecture’, because of the local dominance of architectonicity wherever it is present.

Third, in the absence of such spatial limitations, ‘connective phenomena offer an avenue of infinite subtlety in their capacity for infinite resolution and an avenue of infinite grandeur in their capacity for infinite extent. Infinity of resolution and extent are not available in architectonic contexts.’

Once again I would remind the reader that there is no reason for preferring an understanding from a narrow perspective to one from the broadest possible perspective: the phenomena the cosmos can give rise to ultimately tell us as much about the cosmos as the elements to which it may seem to be – but never can be – reduced.

Returning to the theme of the coincidence of opposites, I see here confirmation that fluidity at a cosmic level contains and does not annihilate, but creates out of, strong local forces that on their own tend away from flow and towards granularity. In the infinite case, and even in the very large case, the more yielding force of union most obviously takes up into itself and transforms the more locally prepotent forces for division, something which happens, though less obviously and with diminished power, even at the smallest scale.

We need both the architectonic and the connective. We need both division and union. We need both analysis and synthesis. We need both left and right hemispheres. This is clear. If I sometimes seem to emphasise the second unduly, it is for two reasons. In our reductionist culture it is the one of which we more urgently need reminding: a pragmatic reason. More importantly it is, like it or not, the ‘senior partner’ in their relationship: a metaphysical reason. The left hemisphere exists in service to the right. As long as this is respected, all goes well; when it is not, we court disaster. Each needs to be allowed its head: but at the end of the day the products of the first need to be taken up by the second into a newly enriched whole.

There is testimony to this master-servant relationship from many cultures and periods. Einstein wrote:

Certainly we should take care not to make the intellect our god; it has, of course, powerful muscles, but no personality. It cannot lead, it can only serve; and it is not fastidious in its choices of a leader ... it is blind to ends and values. So it is no wonder that this fatal blindness is handed on from old to young and today involves a whole generation.⁷⁸

On the topic of the equal necessity, but unequal status, of spiritual opposites, James reflects:

Looking back on my own experiences, they all converge towards a kind of insight to which I cannot help ascribing some metaphysical significance. The keynote of it is invariably a reconciliation. It is as if the opposites of the world, whose contradictoriness and conflict make all our difficulties and troubles, were melted into unity. Not only do they, as contrasted species, belong to one and the same genus, but *one of the species*, the nobler and better one, *is itself the genus, and so soaks up and absorbs its opposite into itself.*⁷⁹

This rings true to my experience, too. Every adult human being must learn to accept the contradictions in himself or herself which we all inevitably embody; and learn even to embrace them. This acceptance and embrace is not just good for us in the sense that, while it does not change anything, it brings us to a position of reconciliation with ourselves: it does really effect a *change*. It helps us draw the venom of what Jung called the dark side. If we believe we must be only and always good and loving, paradoxically we give rise to the opposite of this in its ‘most unbridled and perverse forms ... Apparent contradictions within the human psyche are (as Jung later observed) mutually dependent relations.’⁸⁰

Jung indeed observed that, not only do we often seem to act in what could be seen as far from our better interests – a phenomenon known to Plato and Aristotle as *akrasia* – but ‘the self is made manifest in the opposites and the conflicts between them; it is a *coincidentia oppositorum*.’⁸¹ In other words, the self is not just accidentally, frustratingly, and puzzlingly, contrary in its workings, but actually is itself a coincidence of opposites, and becomes apparent to us in and through those opposites. Montaigne, Western literature’s most acute self-observer, testifies to this truth in almost every page of his *Essais*. There is certainly an argument that we are only aware of being a ‘self’ when there is some immediate and unresolved conflict. When we are absorbed in the flow of life, the fact of being a self – all ‘self-consciousness’ – retires from view.

THE SPECIAL ROLE OF ASYMMETRY IN THE LIVING WORLD

The union of union and division, of love and strife, in the living world is a recurrent theme of Goethe's:

Dividing the united, uniting the divided, is the very life of Nature; this is the eternal systole and diastole, the eternal coalescence and separation, the inhalation and exhalation of the world in which we live, and where our existence is woven.⁸²

In the generation of reality, this rhythmical movement forms a cycle, like the cardiac cycle: systole and diastole, the phases of contraction and relaxation within the beat of the heart, the alternations of inspiration and expiration. But this is far from being a mechanical alternation, but alive and always responsive. Goethe's emphasis on *life* is important. And thinking of the eternal systole and diastole reminds me how forcibly I was struck by learning, while in training on the obstetric wards, that when the foetal heart is entirely regular, this is an emergency. A normal heartbeat is flexible, responsive, never regular: it is like a line of plainsong. When it becomes as regular as clockwork the life is, literally, going out of the body.⁸³

All music involves – like plainsong – subtle variation of the flow, a degree, however slight, of *rubato*. There is sameness and there is difference within it. This is very marked in some forms of swing music, but it is also everywhere present in classical music, not just in performance but in its essence. Bach's music, for example, is the very image of difference within sameness, and sameness within difference – harmonically; contrapuntally; and rhythmically. Bach is in fact the greatest image of this I know.

It is the nature of all art, to establish a regularity and then depart from it – crucially, nonetheless, without imperilling the overall integrity of the work. There are many 'counterpoints' to this in poetry. All verse plays with departures from and returns to an established pattern of ictus that is heard behind the movement of the verse. And I have discussed, in another chapter, the nature of rhyme, which is like a harmony that is stretched over time, rather than simultaneously perceived, as it is more usually thought of in

music, and where the point is difference and sameness together.⁸⁴ Perhaps even more striking is the case of half-rhyme, so beautifully exploited in Wilfred Owen's visionary, spine-chilling poem, 'Strange Meeting', whose theme is indeed the 'other' that is not other: a dream in which he encounters a German soldier he has killed. The poem famously ends with the dead soldier's words to Owen:

I am the enemy you killed, my friend.
I knew you in this dark: for so you frowned
Yesterday through me as you jabbed and killed.
I parried; but my hands were loath and cold.
Let us sleep now...

It is interesting that the Russian word for 'other' or 'different', *drugoi*, has the same etymological root as the word for 'friend', *drug*.⁸⁵

A consistent theme of this book is that to stand in relation to someone or something requires us to be close to, but sufficiently distinct from, the other: having what I call 'necessary distance'. Or half-rhyme. It is not enough that we should have the unison of sameness; we should also have the harmony of difference. The import of the name *Sandokai*, probably the core text of Zen, is 'the harmony of difference and sameness'.

What we know of the physics of the universe emphasises the inescapable marriage of sameness and difference in the universe, and that this is central to its creative nature. Physicist David Oliver suggests that the laws of motion and emergent quantum randomness are like the warp and weft of a single fabric, order and randomness forming the creative whole:

The quantum spontaneity of the universe is expressed in a law of nature, the Heisenberg Uncertainty Principle. This outstanding law declares 'there is no law.' This is not a paradox. We can more precisely state 'there is no law that completely fixes the outcomes of every physical interaction, every dynamic event.' It's the law. But much of the outcome is lawfully ordered and predictable. Nature is neither inevitably random nor completely lawful and predictable. Quantum spontaneity is only one-half the story. The other half is the regularity and predictability of the universe ... The uniquely

quantum nature of the dynamic is that quantum dynamics produce both definite new states highly correlated with existing states and spontaneously random new states ... The Law of Motion captures the continuity and stability of motion while the quantum nips at its heels injecting wisps of novelty and new possibilities into every change of state.⁸⁶

The balance between the repeatable and the unpredictable is maintained in genetics, as Denis Noble has emphasised: I will return to that in Chapter 27.

The brain is a beautiful expression of the need to combine sameness and difference, order and disorder. György Buzsáki and a colleague, Markku Penttonen, examined the relationship between different brainwave patterns ('neuronal oscillatory frequencies') in a rat's hippocampus.⁸⁷ They found there were three independently generated frequencies in widely different, but reliably predictable, ranges. Intrigued, they turned to a wide range of mammals. They discovered that there are similar 'bands' of frequencies, ranging from around 0.02 Hz to 600 Hz, generated by different brain structures. However, they were amazed to find that these frequencies were related, not by multiples of whole numbers, but by the natural logarithm base e , 2.71828. The point is that, since e is an irrational number – that is to say, it is never-ending and cannot be written as the simple ratio of two whole numbers – no frequency in the series can ever 'phase-lock' with any other frequency. What is more there were no gaps in this series of frequencies. 'In other words', writes Barbara Goodrich, 'the whole system of the brain is cooperating so as to permit the different frequencies *not* to entrain each other. This is understandable when we consider that a completely ordered, predictable system cannot itself predict or react to change very well.'⁸⁸ And she continues:

In summary, Buzsáki views the mammalian organism as the most complex system of nature's devising, one which is built from elements relying on opposing forces, including opposing sodium and potassium ion flows, inhibitory versus excitatory neurons, and the predictability of individual oscillation frequencies interacting

with the non-predictability of non-linear interactions among neurons kept in a metastable condition.⁸⁹

Balance needs to be constantly disturbed and restored. Symmetry-breaking is everywhere in living organisms; it may be argued that all qualitative cellular transitions and cellular decision-making are forms of symmetry-breaking, and it is indeed ‘fundamental to every physiological process’.⁹⁰ This echoes Schelling’s perception, contained in a passage from his early treatise *On the World Soul* called ‘Of the negative preconditions of life processes’, in which he speaks of an equilibrium to life that *must* constantly be disturbed and re-established: lost and regained.⁹¹ D’Arcy Thompson saw that,

if the symmetry be ever so little disturbed, and the shape be ever so little deformed, then there will be forces at work tending to increase the deformation, and others tending to ... restore the spherical symmetry.⁹²

Thus the structure of the system we begin with does not wholly determine its own result. Perfection can constitute a flaw. It may be for this reason that in traditional Chinese architecture, the last three tiles are always left off the roof, as the first great Chinese historian, Ssu-ma Ch’ien, records:

Even heaven is not complete; that is why when people are building a house they leave off the last three tiles, to correspond. And all things that are under the sky have degrees. It is precisely because creatures are incomplete that they are living.⁹³

There is also a necessity for slight imperfections in DNA transcription for there to be change and creativity: evolution.

Hegel believed that otherness was actually prior to sameness, sameness being merely an unusual subset of opposition in which the opposites happened to be wholly reconciled. Sameness is, indeed, sterile, and cannot give rise to anything: to this extent he must be right. For creativity there must be complementarity, a degree of resistance within oneness. This idea

is bodied forth in the myth of the two brothers, and in the philosophical embrace of the *coincidentia oppositorum*.

CONCLUSION

I have argued that, at the origin of everything, there lies a coincidence of opposites that is profoundly generative, indeed necessary for creation, and gives rise to all that we know; and that this coincidence of opposites is by no means contrary to reason. I have stressed that we must not be tempted, left hemisphere fashion, to resolve the necessary tension by pretending that one of the pairs of opposites either can safely be dispensed with, or is not real. Denying the concealed opposite is dangerous. The coincidence of opposites does not compromise their nature as opposites: rather they fulfil themselves through one another. At the foundation of everything is the opposition, recognised from Empedocles to Goethe, between Love and Strife: the opposite dispositions embodied by He Grasps the Sky With Both Hands and Flint. A harmonious world comes into being only if the forces of love and strife are unified: He Grasps the Sky allows Flint his degree of independence, but needs to retain a degree of oversight; without it, 'Flint will forever attempt to destroy his rule'. We need the union of division and union, of multiplicity and unity; the left hemisphere needs ultimately to act as servant to the right hemisphere master, since, unbridled, the left hemisphere is capable of destroying the world.

Moreover, what we think of as good may conceal harm, and what we consider harmful may bring something of great value. And I have suggested two geometrical images. We should be wary of linear models in our attempts to understand the world (except at the most minutely local level), and replace straight lines with helices, which incorporate an acknowledgment of the coincidence of opposites with the idea that there is always change and growth, not mere repetition, as the image of the circle risks suggesting. And, just as there is an asymmetry in the relationship of the hemispheres, there is an asymmetry in the *coincidentia oppositorum*. We need not just difference and union but the union of the two; we need, as I have urged, not just non-duality, but the non-duality of duality with non-duality; and we need not just asymmetry alone, or symmetry alone, but the asymmetry that is symmetry-and-asymmetry taken together. I will have more to say about the last of these particularly, in subsequent chapters. Now

let us turn to one very particular opposition that is a conjunction: that between the one and the many.

THE ONE AND THE MANY

οὐκ ἐμοῦ ἀλλὰ τοῦ λόγου ἀκούσαντας ὁμολογεῖν σοφόν ἐστὶν ἐν πάντα εἶναι.

It is wise, listening not to me but to the *logos*, to agree that all things are one.

It is wise, listening not to me but to the *logos*, to agree that the one is all things.

—*Heraclitus*¹

Students achieving oneness will move ahead to twoness.

—*Woody Allen*²

‘IN THE MAKING OF EVERY ANIMAL THE PRESENCE OF EVERY OTHER ANIMAL has been recognized’, wrote John Muir:

Indeed, every atom in creation may be said to be acquainted with and married to every other, but with universal union there is a division sufficient in degree for the purposes of the most intense individuality; no matter, therefore, what may be the note which any creature forms in the song of existence, it is made first for itself, then more and more remotely for all the world and worlds.³

Everything is part of one whole, connected to every other part by a matter of degree. But everything is also absolutely unique: has ‘the most intense individuality’. The Anglo-Polish philosopher Leszek Kolakowski, following Bergson, relates this to the existence in all living things of some form of memory:

A determinist states that, in the same conditions, the same phenomena occur. However, the same conditions can never, by definition, obtain in the life of the self, because each, artificially isolated, moment of its duration includes the entire past, which is, consequently, different for each moment. By contrast with the universe of abstract equations, the same situation never occurs twice in the being endowed with memory; since real time is absolutely irreversible, neither the same cause nor the same effect can ever reappear in experience.⁴

And in a more primitive sense, it has universal applicability, not just to the living. As Smolin says: ‘no movement ever repeats. Looked at in enough detail, every event in the universe is unique ... the more detail we note, the more apparent it is that no event or experiment can be an exact copy of another.’⁵

In this chapter I want to consider the central paradox of the one and the many – or, rather, paradoxes, since there are many, not just one. I say ‘central’, because it takes us to the core of what it means to be at all.

UNIQUENESS AND GENERALITY

Your identity, which in an important sense means that which distinguishes you from others, literally means sameness (from Latin, *idem*, the same; thence *identidem*, again and again). What makes you the same again and again – from moment to moment – is the very thing that makes you different from others. Internal sameness is a condition of external difference. As we have seen, in some kinds of right hemisphere dysfunction, continuity over time, the glue that holds the forms and patterns of the world together, is lost; thus your identity is lost. The logical result is that you are no longer unique and that you are at any instant *reproducible*. Hence we have the man who had eight ‘doubles’, each with a copy of his wife and children, each living in a replica of his city. In this situation you have lost your identity because others are identical to you. This is why Capgras and Fregoli syndromes are manifestations of the same phenomenon, even though one involves seeing someone you don’t recognise in someone you do, and the other involves seeing someone you do recognise in someone you don’t. Loss of uniqueness is the core deficit in delusional misidentification. And that sense of uniqueness is dependent on the right hemisphere.

The meeting of sameness and difference in identity may seem on the surface surprising. But uniqueness is always underwritten by some respect in which uniqueness does not apply. To know that anything is unique requires understanding the ways in which it differs from something else it might have been: you are a unique human being, and the generality of your being *a human being* is still there, but hidden in the particularity, if I simply call you ‘unique’. If there were no general patterns at all, there would not be uniqueness, but mere chaos.

To see each thing as it really is requires a balancing act. On the one hand, we need to see it as unique: nothing that exists is ever the same as anything else. Yet one aspect of what it really *is* requires us to see where it fits into the context of everything else; and to see that, we need generalities. And to appreciate the relationship between uniqueness and generality means always to balance sameness and difference.

Numbers of things also intrinsically imply both sameness and difference. Referring to number, when applied to elements of experience, automatically invokes sameness and difference simultaneously. If we speak of two coins, we imply multiplicity, in that there are two, and singleness, in that they are coins (not, say, a coin and a button). In fact, for any two or more entities to be unlike, they must be like in some respect, and vice versa, so that, as Gerard Manley Hopkins put it, in a Platonic dialogue on the nature of beauty, ‘Likeness therefore implies unlikeness ... and unlikeness likeness’.⁶

This sycamore leaf in my hand is different from any other sycamore leaf that ever existed: it is unique. But it is also not just an interesting piece of abstract art, an irregular shaped, planar object of a certain colour and texture, but, precisely, a sycamore leaf, a certain type of thing, a leaf, and a certain type of leaf, that of a sycamore tree, which is a certain type of tree, a certain kind of living being, which means it has many predictable properties and functions, and has its own proper place in the world. If I ignore that, I scarcely know what it is at all. We need to see both the unique and the general *at once*. As a child, the excitement lies in discovering that not everything is unique, but that there are general categories giving shape to the world: ‘Birdie!’, ‘Bunny!’, ‘Doggie!’. This gives pattern to experience. As adults we have become so used to this, that we have to make an effort in the opposite direction: the excitement comes only when we recover the uniqueness of what it is we contemplate.

Like identity, the word ‘essence’ also has a double life. In one sense it is what makes you absolutely you-and-not-someone-else: the very *essence* of you. Yet you are also, in *essence*, a human being. This was a distinction indirectly illuminated by the phenomenological philosopher Max Scheler, who contrasted here the child and the adult. Of Scheler’s writing on this in *The Constitution of the Human Being*, John Cutting, who translated the English language version, comments: ‘in childhood you are an empiricist, but in adulthood the essence squeezes out all new experience ... the essence brooks no opposition. This is how things are.’⁷ This shift, from the unique presence to the general re-presentation is made palpable in the change with age of which Wordsworth complained: that the real, experienced presence of the mountains and lakes as a child was overwhelming – they were, in our terms, present ‘in their very essence’ to him, awe-inspiring and unique; while as an adult he could see them only as re-presented, now become the

essential Mountain and the essential Lake. This different kind of essence has too much generalisation about it; it has pre-empted and squeezed out the other essence that is present only in experience. As Evelyn Underhill would say, the hare of reality was for him now already juggled.

Yet this essence also has its uniqueness of a kind, viewed at a different level. What functions as general at one level functions as unique at the next. Take the generalisation that the leaf is from a sycamore tree. Yet among sycamores, this particular sycamore tree is unique. And among trees, the type 'sycamore' is already unique. There is an essence, a proper form, of a sycamore. There is a 'thisness' to the type, as well as to the individual. It matters only at what level you place the bar. To take Wordsworth's case, do we place it at the uniqueness of this experience of Ullswater here and now as it can only be when embodied and present? Or at the uniqueness of Ullswater, considered more generally? The uniqueness of the Lake District? The uniqueness of mountainous lakes? At one extreme, everything is alike; at the other, nothing is like anything else. In either case there is no pattern to reality. The trick is to find the level at which the richest patterns are revealed in the context in which one finds oneself.⁸

Normally, analytically, we think of difference and sameness as incompatible, like being both one and many. But they constantly interpenetrate one another and give life to one another. (As, in fact, do the One and the Many – always.)

BEAUTY, AND THE COINCIDENCE OF THE ONE AND THE MANY

Connexion always produces difference along with union. An interaction is, at the same time, *both* an act of coming together, *and* the process through which each party becomes more itself. In another observation of Hopkins’,

Beauty then is a relation ... and things which have a relation are near enough to have something in common, but not near enough to be one and the same.⁹

The coming together of sameness and difference makes relation possible; and, if, as I believe, everything exists *only in relation*, this ‘coming together’ must be essential – at the very ground of – all that is. Harmony is the instantiation, not just of sameness and difference, but of a special creative relationship between them: in an excess of either it disappears into mere unison or mere discord. And beauty is the experience of this harmony. Once again the trick is in finding the right level that gives the richest patterns.

In the Preface to *Lyrical Ballads*, Wordsworth describes ‘the pleasure which the mind derives from the perception of similitude in dissimilitude. This principle is the great spring of the activity of our minds, and their chief feeder.’¹⁰ In other words, he is ascribing a creative power to such a perception, stimulating what Coleridge called the Primary Imagination.

Hopkins continues his Platonic dialogue:

— Then the beauty of the oak and the chestnut-fan and the sky is a mixture of likeness and difference or agreement and disagreement or consistency and variety or symmetry and change.

— It seems so, yes.

— And if we did not feel the likeness we should not feel them so beautiful, or if we did not feel the difference we should not feel them so beautiful. The beauty we find is from the comparison we

make of the things with themselves, seeing their likeness and difference, is it not?

Harmony cannot exist without just the *right degree* of otherness within the whole. It is not, clearly, sameness alone or difference alone, nor sameness and difference together alone, but the nature of the *relationship between* sameness and difference: the betweenness. As in a thriving society, as in a healthy organism, as in anything beautiful, there is a proper relationship between the principles of differentiation and unity.

Beauty in music does not necessitate literal musical harmony, since the vagaries of a single melodic line also consist of the many relationships between notes, relations of qualified difference: a melody evokes harmonics that are spread over time. Some of the most beautiful sounds in the world are single lines – in folk music, in Bach’s unaccompanied violin and cello music, and in Gregorian chant, for example. Indeed for the Greeks the term harmony in music was used, not of notes sounded at the same time, but ‘only of notes that were heard successively’: it was like rhyme, which is a kind of harmony that always creates tension between two or more moments in a temporal span. It was not until the Middle Ages that ‘the word is applied to the concord between simultaneously sounding notes’.¹¹

Yet literal harmony of this kind has a special richness. As an undergraduate, I looked forward to the moment in the church calendar when the choir of my then Oxford college would sing Tallis’s setting of the Litany. It begins, in the full liturgical setting, very simply with many bars of repeated lines of plainchant: but then there comes a moment, when the choir takes a steep, and at that moment unexpected, plunge into homophony (chordal harmony), as restrained as it is profound. If ever one wanted confirmation of the mysterious power that harmony can add to melody, this was the moment. In retrospect it reminds me of the last three minutes of Tarkovsky’s film *Andrei Rublev*, where, after three hours of unforgettable black and white cinematography, the film suddenly goes into colour as we contemplate the actual paintings that are the outcome of the suffering we have been witnessing for the last three hours. Colour too has its harmonies (and therefore its discords). But the harmony was richer for the plainsong; the colour for emerging from black and white.

As I mentioned in the previous chapter, Hegel made the important point that sameness and difference, unity and division, have themselves to be

unified; this seems to me from experience clearly right. Note this suggests the ultimate priority of the principle of union over that of division, despite the necessary part played by division at one stage of the process.

SMALL DIFFERENCES CAN MAKE LARGE DIFFERENCES

Let us return to uniqueness. I love William James for many things, his unusual combination of intellect with wisdom, for one, and of intellect with humility, for another:

An unlearned carpenter of my acquaintance once said in my hearing: ‘There is very little difference between one man and another; but what little there is, is very important.’ This distinction seems to me to go to the root of the matter.^{[12](#)}

In a way this is the point I made, at the outset of this book, about hemisphere difference. Small differences can make large differences. It is manifestly true of individual people, but could also be applied to the differences between individual groups, including nationalities or the sexes, or those between a great and a minor artist. In face-to-face conversation, a minor change in the eyes, subconsciously detectable for only thousandths of a second, can make a huge difference to the direction of that conversation. As we encounter experience it is unique; yet as we represent it to ourselves, it becomes general. As Whitehead put it, ‘we think in generalities, but we live in detail.’^{[13](#)}

PARTS, WHOLES AND HEMISPHERES

The word ‘detail’ here is unfortunate, because it means the embodied and unique (rather than the general), which is not the same as ‘detail’ in the sense of a small part. So this prompts me to make an important distinction.

Each hemisphere deals in *parts* of a kind, and each deals in *wholes* of a kind; this is hardly surprising, because each has to negotiate and make sense of the world. But they do it in different ways, suggesting a different relationship between the ‘parts’ and the ‘whole’. In the left hemisphere case, there are fragments, which must be put together to form an aggregate. In the right hemisphere case, there are wholes at any number of levels, in which parts can be distinguished. In the right hemisphere case things remain maximally diverse, yet unified; in the left hemisphere case things are minimally diverse, yet fragmented. A similar distinction can be made between the process of *individuation*, an internal unfolding into complexity, which respects, never departs from, and enriches the whole; and mere *individualism*, which fragments, atomises and destroys the whole. Heidegger is unusually clear on this, helped by the German language which distinguishes *Stücke* (fragments) from *Teile* (parts) – the word comes from *teilen*, to share or divide, and thus alludes to its *post factum*, retrospective not compositional, nature. He writes that

the fragment [*das Stück*] is something entirely other than the part [*der Teil*]. The part shares and imparts itself [*teilt sich mit*] with [by, as, in] part of the organic whole [*das Ganze*]. It takes part in the whole, belongs to it. The fragment on the other hand is separated out and indeed is thus as fragment, as what it is, only as long as it is locked up in opposition to other fragments. It never shares and imparts itself in and as part of an organic whole.¹⁴

In societal terms, one might contrast the left hemisphere idea of an individual being, an idea that is, if you like, univalent (individual as defined over against the group); and a right hemisphere idea of an individual being, one that is bivalent, or reciprocal (individual as generated by, and in turn taking part in generating, the group).

LOVE IN THE TIME OF BUREAUCRACY

The drive behind categorisation is disconcerting when it results in too much emphasis on sameness. Then it speaks of alienation and the power to manipulate, both qualities associated with the left hemisphere rather than the right. It is how bureaucracies and commerce work in relation to individuals. It is a perhaps necessary evil, a tool that helps us organise knowledge towards a particular goal: as James also said, 'every way of classifying a thing is but a way of handling it for some particular purpose.'¹⁵

Mozart's opera *Don Giovanni* contains the most famous *exposé* of categorisation of all time. Here the Don's manservant Leporello reads from the list of his master's conquests, to Donna Anna, his master's latest acquisition:

My dear lady, this is the list
Of the beauties my master has loved, A list which I have
compiled.
Observe, read along with me.

In Italy, six hundred and forty;
In Germany, two hundred and thirty-one; A hundred in
France; in Turkey, ninety-one; But in Spain already one
thousand and three.

Among these are peasant girls,
Maidservants, city girls,
Countesses, baronesses,
Marchionesses, princesses,
Women of every rank,
Every shape, every age.

With blondes it is his habit
To praise their kindness;
In brunettes, their faithfulness;

In the white-haired, their sweetness.

In winter he likes fat ones.

In summer he likes thin ones.

He calls the tall ones 'majestic'.

The little ones are always 'charming'.

He seduces the old ones

For the pleasure of adding to the list.

His greatest favourite

Is the young beginner.

It doesn't matter if she's rich,

Ugly or beautiful;

If she wears a skirt,

You know what he does.¹⁶

While the Don continues his wars of conquest, someone else, the servant who lies outside the circle of *eros*, matter-of-factly compiles the database – on his behalf. Quantity is, of course, the first essential: never a good starting place for love. Within it, all are carefully listed and neatly categorised by nationality, social status, height, build, age. Leporello could be seen as an obsessional lepidopterist, pinning another specimen for the Don's collection: but viewed another way he is a bureaucrat (he keeps detailed statistics) with excellent diversity credentials, as you see. He delights in recounting how the Don does not discriminate, but shows how he thereby falls into the category of those who are indiscriminating. The Don makes sure that while making no discriminations he has representatives of every discriminable category. Rather as modern bureaucracies devote considerable energy and attention to categories of people for the professed purpose of demonstrating that such categories are without foundation, he carves up his clientele so as to make sure he has them all in his list, but treats them all the same, whether they are rich, poor, thin, fat, old, young, dark or fair. The categories merely help him manipulate things better to his own ends: once the type is identified, he invariably applies the same tired formulae to make them conform. This is,

of course, nothing to do with love. Such ‘loving’ devalues its objects, by substituting labels and categories for individually different living beings, makes them means rather than ends, and lends itself to greed, abuse and never-to-be-satisfied restlessness: Don Juanism.

Nietzsche called us, in the modern West, the Don Juans of cognition, hungrily acquiring what we take to be understanding, but acquiring only knowledge ‘about’ (*wissen*), not knowledge ‘of’ (*kennen*) – and passing everything through the mill of our categorising mentality.¹⁷ He that would love, must love individuals, not generalities. You can admire or be attracted to womanhood, or manhood, but you cannot *love* them.

Making things equal helps turn them into fodder for our own existing purposes. Nietzsche reflected a good deal on this in his notebooks, and put his finger on a number of important points. ‘The entire apparatus of knowledge’, he wrote, ‘is an apparatus for abstraction and simplification – directed not at knowledge but at taking possession of things’.¹⁸ He refers to ‘the utilitarian fact that only when we see things coarsely and made equal do they become calculable and usable to us’.¹⁹ This is the root of totalitarianism: we are the Don Juans of cognition.

Generalisation turns things into means to an already defined end, left hemisphere fashion. In this Nietzsche seized the essence of left hemisphere cognition: the will to power. And referring to the drive to render things equal – thus untroubledly the same – in order to be able to use them, he compares it to an amoeba engulfing and digesting its prey:

In *our* thought, the essential feature is fitting new material into old schemas (= Procrustes’ bed), making equal what is new [the LH trying to preserve its preferred way of looking at things at all costs]
...²⁰

And he carries on:

All thought, judgment, perception, considered as comparison, has as its precondition ... a “*making equal*”. The process of making equal is the same as the process of incorporation of appropriated material in the amoeba ...²¹

And further:

the fundamental inclination to posit as equal, to *see* things as equal ... corresponds exactly to that external, mechanical process (which is its symbol) by which protoplasm makes what it appropriates equal to itself and fits it into its own *forms and files* [the LH categorising what it needs to purposes of its own]. ²²

Speaking of the left hemisphere's gross and approximate understanding that serves well its unsubtle purposes, he continues:

the coarser organ sees much apparent equality; the intellect *wants* equality, ie, to subsume a sense impression into an existing series: in the same way as the body assimilates inorganic matter ... the will to equality is the will to power – the belief that something is thus and thus (the essence of *judgment*) is the consequence of a will that as much as possible *shall be* equal. ²³

The lust for control lies behind the demand that all shall be equal to – reducible to – something else. The process is one, as Nietzsche makes clear, of triumph by reductionism: ingestion (appropriation by the left hemisphere), followed by digestion (lysis into parts).

First, uniqueness is lost in categorising: a triumph for sameness. The next step is to lose the uniqueness of the category – and the triumph for sameness is almost complete. To be a citizen of the world is to be a citizen of nowhere; to love everyone and no-one in particular is not to love. As Solzhenitsyn remarked in his Nobel acceptance speech:

Were nations to disappear, we would be impoverished in exactly the same way as if all people suddenly became alike, with the same character and the same face. Nations are part of the wealth of the human race. Although generalised, they are its individuals. The smallest of them has its own special colours and hides in itself some special facet of God's design. ²⁴

Similarly Whitehead wrote that

the first step in science and philosophy has been made when it is grasped that every routine exemplifies a principle which is capable of statement in abstraction from its particular exemplifications. The curiosity, which is the gadfly driving civilisation from its ancient safeties, is this desire to state the principles in abstraction. In this curiosity there is a *ruthless element which in the end disturbs*. We are American, or French, or English; and we love our modes of life, with their beauties and tendernesses. But curiosity drives us to an attempt to define civilisation; and in this generalisation we soon find that we have lost our beloved America, our beloved France, and our beloved England. The generality stands with a cold impartiality, where our affections cling to one or other of the particulars.²⁵

Charitable schemes are not the same as, and no guarantee of, charity. We must deal with the actual and individual, not the theoretical and general. Blake famously wrote:

He who would do good to another must do it in Minute
Particulars: General Good is the plea of the scoundrel,
hypocrite & flatterer, For Art & Science cannot exist but
in minutely organised Particulars And not in generalising
Demonstrations of the Rational Power.
The Infinite alone resides in Definite & Determinate Identity
...²⁶

‘Generalising demonstrations of the rational power’ are the left hemisphere’s *modus operandi*. The last line here is striking for its paradoxical nature: ‘The infinite alone resides in definite & determinate identity’. The point Blake is making is that we do not come to understand or experience the infinite, or, for that matter, the eternal, by attempting somehow to transcend the finite or the temporal, but by immersing ourselves in them, in such a way as to pass into the infinite, manifest there where they are. The path to the infinite and eternal lies in, not away from – not even to one side of – the finite and the temporal. The infinite and eternal

are manifest here, where we are, within the translucency of space and time. Blake saw that this forms a parallel to the relationship between the particular and the general, that we find the general manifest *in* the particular, not by turning our backs on it.

HOW THE GENERAL AND THE UNIQUE RELATE

On this relationship between the utterly unique and the whole world beyond, philosopher Jan Zwicky writes: ‘*Thisness* is the experience of a distinct thing in such a way that the resonant structure of the world sounds through it. Each *this* focusses that resonant structure in a distinct way. But the structure so focussed is – of course – always the same. There is only one world.’²⁷

The history of the cosmos looks like one of constant divergence into multiplicity and uniqueness, yet a uniqueness that is always subsumed within, and understood against the background of, a coherent whole. One hydrogen atom is more or less the same as another – though Smolin’s point that ‘every event in the universe is unique’ stands. On the other hand, no one flower, tree, bird or animal, not even one snow crystal or lump of rock, is at all the same as any other, and whatever lives is constantly ramifying into ever-renewing newness. The effect of the evolution of matter, never mind that of life, is to diversify exuberantly; and even the function of genes is not just to fix, but also to vary.

Life, in its essence, is a making new: a wholly superfluous, superabundant, self-overflowing – an exuberant, self-delighting process of differentiation into ever more astonishing forms, an unending dance, in which we are lucky enough to find ourselves caught up – not just, as the left hemisphere cannot help but see it, a series of survival problems to conquer. If reality is ultimately just an eternal, unchanging, perfect unity, as some philosophies seem to suggest, life is going the wrong way about making that clear. To the degree that we can discern any governing principle to the cosmos, it is not going to be parsimony. The One may be simpler than the Many, but the world as we know it emphasises individuation and multiplicity, not singleness and simplicity.²⁸ Connexions between relative samenesses (subatomic particles) produce great differences (the 10,000 things); the connexions between differences never produce sameness, but new wholes as they resonate with one another, forming new responsive relationships.

Shakespeare is as near to embodying the creative process as anyone we know; and Coleridge called Shakespeare ‘myriad-minded’, by which he

meant that by a feat of the imagination he could feel his way into the depth of being of his characters, each of them entirely original, which meant that none of them was ever just a reproducible type but, like a real person, what we would call a complete 'one-off'. Not infrequently his characters' insistence on being who they were, not just what the stereotypes of the plot demanded of them, caused Shakespeare to change the story in order to accommodate their stubborn, vibrant thisness. Is not all creation, similarly, a work of myriad-mindedness, in which the stubborn resistant element too plays its part?

Thisness has a piercing vibrancy; generality is flat. 'We are pierced', writes Zwicky:

The *this* strikes into us like a shaft of light. We are focussed by it and experience it as focussed: what is *this* is unique, it has an utterly distinct – and here notice the sense modality we reach for – flavour or fragrance. (What is important about the metaphor is that it recognizes the object as knowable but neither visible nor graspable.) Often the experience also includes an awareness of not being able to give an account of the *this* – we can point, but not say.²⁹

As Hopkins found, too, flavour or fragrance are the modes of thisness: the sense of taste and smell are not only, as we have seen, the most finely discriminable of all sensory modes by a very long way, but they famously defy description in language (hence the common jokes at the expense of oenophiles), and are not decomposable into elements without their thisness being manifestly lost. Hopkins refers to

that taste of myself, of I and me above and in all things, which is more distinctive than the taste of ale or alum, more distinctive than the smell of walnutleaf or camphor, and is incommunicable by any means to another man ... searching nature I taste self at but one tankard, that of my own being.³⁰

It is possible to become so used to the left hemisphere, represented world, which deals in classes of things, and the rules they obey, that the embodied reality of what is never general, always unique, escapes us. Left

hemisphere rules take over from right hemisphere insight. Yet it is the unrepeatable thisness of anything – at any rate, anything that is not mechanical or machine-made – that is its essence, its fulfilment and its value: even, one might say, its *raison d'être*. It is an invariable quality of everything we love: the particular essence of a person, a place, or a work of art, which cannot be replaced by anything else whatever, any more than can your best friend: if the work had not come into existence, we could not have imagined it, and there would be a hole in the universe where it should be.

This quality is present everywhere our attention allows, and it was this 'being always just itself and no other thing', that by definition defies definition, this *hæcceitas*,³¹ that Hopkins celebrated in all his work, and most famously in the poem 'As kingfishers catch fire':

As kingfishers catch fire, dragonflies dráw fláme;
As tumbled over rim in roundy wells
Stones ring; like each tucked string tells, each hung bell's
Bow swung finds tongue to fling out broad its name;
Each mortal thing does one thing and the same:
Deals out that being indoors each one dwells;
Selves – goes itself; *myself* it speaks and spells,
Crying *Whát I do is me: for that I came*.

These opening lines also exemplify their subject: their style is highly idiosyncratic, and they take a bit of patient unpacking. But the message is clear. Each living creature (mortal thing) is unique; it is what it does; and doing it is *in itself* the purpose of the creature's existence. It is also, paradoxically, through each doing 'one thing and the same' that they become the many *different* beings the poem celebrates. Difference and sameness together, never just difference or just sameness.

Because of this manifest variety, general principles are less appropriate than they may customarily seem. 'One Law for the Lion & Ox is Oppression',³² wrote Blake; and 'The eagle never lost so much time as when he submitted to learn of the crow'.³³ There is an uncanny echo of this in Sitting Bull's rejection of the white settlers: 'If the great spirit had desired me to be a white man, he would have made me so in the first place. He put in your heart certain wishes and plans, in my heart he put other and

different desires. Each man is good in his sight. It is not necessary for eagles to be crows.’³⁴

What Blake expresses is that each being has its proper role, its *telos*, and that the context created by its existence dictates that we cannot apply readymade rules derived from quite different contexts. In such a cosmos there is a place for the lion, the wolf and the tiger, as well as the ox, the lamb and the mouse, not by being comfortingly the same, but by being vitally different. We expect each lion or ox, say, to be reliably different from other animals, which means reliably similar to other lions or oxen: it is their essential difference that enables us to form any expectation at all (by their identity at one level they proclaim their non-identity at another). To apply the same laws to all situations indiscriminately is where the single-track left hemisphere mindset leads. Context creates the necessity of discriminating what is proper to different contexts, since, when the context changes, everything within it changes.

According to RG Collingwood, our civilisation has neglected history, and therefore

neglected to develop that kind of insight which alone could tell it what rules to apply, not in a situation of a specific type, but in the situation in which it actually found itself. It was precisely because history offered us something altogether different from rules, namely insight, that it could afford us the help we needed in diagnosing our moral and political problems.³⁵

As we know, the right hemisphere, seeing more broadly, and more deeply, than the left is more sensitive to context.³⁶ So it is hardly surprising that it tends to see each situation as a potential ‘one-off’, not as one off the left hemisphere shelf. The right ventrolateral prefrontal cortex is particularly important for precisely what we are discussing, monitoring whether a course of action is appropriate in context, and preventing it from happening when it isn’t.³⁷ It provides Collingwood’s insight into the particular situation, rather than rules for ‘such situations’ in general.

A PLURALISTIC – BUT INTEGRATED – UNIVERSE

One way of looking at multiplicity is that it is the potential stored in oneness, as the potential for colour is ‘stored’ in white light. That potential multiplicity is constantly actualised over time. According to Antonio Negri, an expert on Spinoza (to whom the following distinction was particularly important), power can be thought of as having two forms: *potentia*, which is fluid, dynamic and constitutive; and *potestas* (the common Latin word for power), which fixes what is constituted. The former is, then, right hemisphere-congruent and the latter left hemisphere-congruent; and the former constantly gives way to the latter, as what *might* be becomes what *is* precipitated.³⁸ But because of the very uniqueness of what is, it is taken up again into the vibrancy of the now enhanced whole. Thus the hemispheres work together, from right to left to right, to maximum benefit.

The money in your bank account decreases as you spend it, as it is converted from potential into actual concrete individual elements in the world. Yet only by doing so can it realise its value. And potential individuates as it actualises: banknotes are effectively identical, whereas what they represent is infinitely diverse. As cells ‘reproduce’ themselves in the growing embryo, their potential becomes successively more limited: what is initially totipotent (has the potential to become any cell in the body) becomes specialised and yields to the actuality of a particular tissue. The potential takes part in what becomes actual, just as the actual takes part in what, *after its appearance*, can be potential. (I shall have more to say about this relationship, in Chapter 22, on time, and Chapter 28, on the sacred.) The potential must be at least as great as the power it ultimately exhibits, possibly infinitely greater.

If one sees potential as energy, and the coming into being of the actual as that energy being consumed or transformed, this may be one of the possible meanings of another Heraclitean fragment: ‘all things are requital for fire, and fire for all things, as goods for gold and gold for goods’.³⁹ In other words, energy (‘fire’) becomes matter, and matter becomes energy: but the gold for goods analogy adds specificity. The general becomes actual and the actual becomes general once more. On this requital, Blake wrote that ‘Eternity is in Love with the Productions of Time’; but he also said

‘The Ruins of Time build Mansions in Eternity’.⁴⁰ There is eternal, and eternally creative, reciprocity.

James referred to what he called ‘a pluralistic universe’ (the phrase became the title of his Hibbert Lectures, delivered in 1908, and published the following year). It seems to me, also, that the tendency of the world, the living world especially, is not towards oneness and sameness, but towards pluralism, difference and particularity – towards beings with a history: away from generalisation and equality, towards ever greater differentiation, relishing the uniqueness, the ‘this-and-no-other-ness’, of each being. Yet all this takes place as the enrichment of a whole from which it is never divorced, and to which, now enriched, it returns. According to the Genesis myth, God made the world by dividing – night from day, heaven from earth, the sea from the dry land, and so on. Division can be creative. Here it made a whole world. Before each cell replicates, the chromosome pairs divide and are actively drawn apart; later they re-form in new pairs to make a new cell. Life, as Shelley says, ‘like a dome of many-coloured glass stains the white radiance of eternity’. But another way of looking at it is that the potential of the white light is actualised by the dome. As Newton was able to demonstrate, pure white light and the rainbow of colours are one and the same; the cosmos seems to me the prism through which the purity of white light is refracted. And yet, importantly, a prism not only splits light into colours, but can also recombine them into white light.

The left hemisphere tends to aggregate the reality-fragments it identifies into categories, within which what the right hemisphere sees as individuals become interchangeable. To that extent the left hemisphere is both a splitter and a lumper, the worst of both worlds, in which things are first artificially separated, and then artificially aggregated, by an effort of cognition. By contrast the right hemisphere sees already existing individual entities, each of them whole, and it sees them as belonging in a contextual whole, from which they are not divided. It is, by contrast with the left hemisphere, neither a lumper nor a splitter.

DIFFERENTIATION WITHIN A NEXUS: THE CENTRAL NERVOUS SYSTEM

As it happens, this distinction lies behind an ancient and, to some degree, ongoing quarrel at the heart of neurology. In 1901, on the very first occasion of the awarding of a Nobel Prize, the Italian neuropathologist Camillo Golgi was put forward for the Prize for physiology and medicine. When he finally received it in 1906, he shared it with the other great neuropathologist of his era, Santiago Ramón y Cajal. You'd think that this would be the cause for common celebration of a shared major scientific advance; yet at the ceremony they did not speak to one another. What had happened?

Golgi developed the silver nitrate stain that has massively improved our ability to visualise nerve cells, and a version of which is still in use today; with its help, he identified the intracellular organelles still known as Golgi bodies. And it was Golgi's technique that enabled Cajal to do his detailed drawings. But they disagreed about the nature of what they saw. Golgi thought that the filaments of the nervous system were interconnected to form a unified network, or syncytium. Cajal believed that there were separations – what Sherrington, in 1897, first termed synapses – between the cells. As we know, Cajal proved to be right on this point. And yet there was truth of a kind in what Golgi saw, too. If one looks at his detailed drawings of nerves (see Plate 17[a]), it is clear that, for all he saw an ultimately connected structure, he also saw a highly differentiated one: equally Cajal (Plate 17[b]), for all he saw a highly differentiated structure, also saw an ultimately connected one.

They both saw *differentiation within union*. A flow, while single, is also differentiated within itself, producing pattern and local form without losing its unity (see Chapter 23). And if we conceive a living organism as a flow, rather than as a machine, all nerves are ultimately interconnected, as much by chemicals in the synapse as by fibres within each nerve. Yet it is the potential for both separation *and* connexion, made possible only by the synapse, that enables necessary differentiation between the elements that constitute the whole, so that the whole is properly articulated. Jean Pierre Flourens, the founder of experimental brain science in the early nineteenth

century, proposed what he called a *sensorium commune*, or common sensorium:

In the last analysis ... all of the essential and various parts of the nervous system have specific properties, proper functions, distinct effects, and in spite of this marvellous diversity of properties, of functions and effects, they constitute nevertheless a unified system. When one point in the nervous system becomes excited, it excites all others ... There is community of reaction. Unity is the great reigning principle; it is everywhere; dominates everything. The nervous system is then only one single system.⁴¹

And yet it is effective as a single, unified system – which manifestly it is – precisely because of differentiation within. It is a resonant, not simply uniform, whole. If *every* nerve really always excited all the others, we could not function at all, any more than if *no* nerve excited any other. Each nerve communicates, potentially, with all others – yes; but either by facilitating and promoting, or by inhibiting and delaying. It is not that in one case there isn't, and in the other there is, communication. *Each is a form of communication.* The existence of synapses, which seems at first sight so cumbersome – why keep interrupting an electrical discharge, by insisting on gaps across which the message must be transmitted by propagating and receiving chemicals? – is in reality of crucial import. In terms of physiology, the advantage reveals itself in flexibility. But there is also metaphysical meaning to the arrangement.

What I mean is this. Since existence always must balance oneness and multiplicity, oneness and differentiation, and since the nervous system underwrites our experience of the world, we would expect it to reflect that structure. The synapse is an embodied metaphor of how every complex system, both in nature and in society, works. By its capacity either to strengthen or weaken connexions that are always present to some degree, it enables both independence and interdependence at the same time.

Disputes between neurological lumpers and splitters go on to this day – for example, between those who believe primarily in 'modules' and those who believe primarily in more global systemic complexes – quite unnecessarily, since each possesses half a truth that only offers its insight

when reconciled, not at war, with the other. The moral? Neither a lumpen nor a splitter be.

There is a tendency in the human mind to want to embrace either unity or multiplicity, but not both. According to Archilochus's distinction, 'a fox knows many things, but a hedgehog one important thing', a distinction made famous by the philosopher Sir Isaiah Berlin, who applied it to categorise (approximately) many great artists and thinkers as hedgehogs or foxes. Yet the intellect requires both. On the one hand, the knowledge of many things is of no use if it is not capable of being held together in a coherent framework; on the other, the single great thought requires unfolding and differentiation.

In marginalia to his copy of the works of Sir Joshua Reynolds, Blake wrote, in the same spirit as the passage I have already quoted: 'To Generalize is to be an Idiot; To Particularize is the Alone Distinction of Merit.'⁴² The point is well taken: but, manifestly, it is also itself a generalisation. Reality is, as ever, two-sided.⁴³

UNIQUE AND GENERAL AT THE SAME TIME: AN INSIGHT FROM ANGLO-SAXON VERSE

The sense of delight in characteristic difference and sameness is expressed in some Anglo-Saxon verses often referred to as *Maxims*, or *Gnomic Verses*. They are moving, powerful and largely neglected. They appear to have little in the way of structure, but could be thought of as existing simply to celebrate the thisness of everything that is, while conveying the fierce indomitable, ruggedness of the world their makers inhabited and of the proper human response to it. Yet what they do is quite complex.

Much turns on the rich ambiguity of a key verb, *sceal*, which is repeated nearly 90 times in the course of these four poems, each of them 60–70 lines long. The ancestor of our word ‘shall’ (and pronounced in a roughly similar way), *sceal* has a number of meanings. It does not predict the future, as it now generally does, but is somewhat closer to its still extant use in making a decree: ‘no officer of the law *shall* under any circumstances accept a bribe’. But it goes much further than that: it honours the cosmic order, something hard for us to recognise given our chaotic vision of the world. That something *sceal* (be or do whatever it may be), is not only a statement of how things are, which would on its own be superfluous; but an acceptance and an affirmation of their being so, as well as an acknowledgment that it is right and proper that things should fulfil their nature in that way, a celebration *of* that fact, and at times an exhortation to do what is demanded of us as right and proper under the circumstances, so as to follow, and further, this flow of things. It has something of the quality of early Ancient Greek *logos* and Confucian Chinese *lǐ* about it.

It covers states of affairs about which we can do nothing – such as growth and decay, the seasons, the elements, or the behaviour of wild animals; as well as those about which we can do something – such as responding appropriately to circumstances that require generosity, magnanimity, skill, courage or fortitude. In other words, it suggests an order out of which we come and to which we respond, and to which we have a responsiveness.

For examples of states of affairs we are powerless to affect:

The tree *sceal* stand on the earth losing its leaves – the branches
[*sceal*] grieve.⁴⁴

The ocean water *sceal* foam with salt, and the cloud and sea-flood
[*sceal*] flow around each and every land, in mighty streams.⁴⁵

For examples of those for which we bear some responsibility:

A ship *sceal* be riveted ...⁴⁶

A mast *sceal* be on the ship, the towering sail-yard; the sword *sceal*
be on the breast, the noble iron ...⁴⁷

The king *sceal* bestow rings in the hall ...⁴⁸

An army *sceal* stand together, a glorious band of men: good faith
sceal be in the warrior, and wisdom in the man.⁴⁹

Sceal also celebrates the belonging of things:

The bow *sceal* be for the arrow, they *sceal* be like companions
together ...⁵⁰

yet without judgment, good and ill having their place together:

A shield *sceal* be for the fighter, a cudgel for the robber; a ring *sceal*
be for the bride, books for the scholar ... ⁵¹

and in a similar vein we are told that:

The thief *sceal* go about his business in dismal weather.⁵²

Most of all, however, *sceal* seems to say that this is no more, but also no less, than the playing out of the multiplicity of creation, whether that be (to mortal eye) for good or ill:

The wild hawk *sceal* light upon the glove. The wolf *sceal* live in the forest, grim and alone; the boar *sceal* be in the woods ...⁵³

The river *sceal* mix with the waves in the sea-flood ... The fish *sceal* be in the water, propagating its kind ... The bear *sceal* be on the heath, hoary and fearful. The rivers from the hills *sceal* flow down as grey as the sea ... The woods *sceal* be on earth, blossoming and flourishing; the mountain *sceal* stand fast upon the green earth.⁵⁴

The birds above *sceal* sport in the wind; the salmon *sceal* dart in the pool.⁵⁵ The shower taken up by the wind of the heavens *sceal* come down on this world.⁵⁶

Each thing, one might say, cries ‘*Whát I dó is me: for that I came*’. For us, having pillaged and defaced the beauty of the earth, and squandered the richness of its living kinds, these verses have, I find, a terrible poignancy – us, the aftercomers their authors never foresaw.

Acceptance, although a virtue in every wisdom tradition since time began, is more a sin in modern Western society than a virtue. But do not imagine that the writer or writers of these verses, whoever they may have been, were simply prescriptive: we do not know everything, they seem to say:

There are as many ideas as there are men upon the earth – each of them has a mind of his own.⁵⁷

And again, speaking of the afterlife:

What is ordained to come is secret and dark – the Lord, the sustaining Father, alone knows. None ever return under these roofs,

who may truly tell to men what the Lord's decree might be, nor speak of the seat of the victorious ones, where He himself dwells.⁵⁸

The paradox is that these particularisations are at another level generalisations, and as generalisations they are particularisations. As Paul Cavill, a scholar of Old English, says, 'verbs in maxims can both generalise and particularise, often at the same time'.⁵⁹ By saying that something belongs in a special way to a special place or in a special role we are suggesting there is a pattern to things: that it is in the *nature* of a bear to be ferocious, and in the *nature* of a hare to be timid. They are thus different from one another (across kinds), yet the same as one another (within kind). It is proper for the wolf to roam in the forest as a predator, because that is its nature. Each wolf is individually different, but not so much that one might expect to encounter a beach-dwelling vegetarian wolf any time soon. This is a parallel to the already discussed case of the individual person: internal continuity is a condition of external difference. In a world without boundaries or patterns, although in one sense everything would be different, by the same token everything would be the same. We are what we are by virtue of our defining, delimiting (in each case, literally 'bounding') qualities, which nonetheless paradoxically liberate ('unbounding') us into being what we are: what we are is disclosed equally by what we are and are *not*. Which is why groups cease to cohere if they have no criteria of exclusion, one of the commonest observations in sociology.

It is not just that, as human beings, our individuality takes its nature and meaning from the groups to which we belong, and that they take their nature and meaning from the individuals that belong to them, so that they are inextricably intertwined and reciprocally generative. It's true of the non-human world, too, and, indeed, of every aspect of experience. If rabbits suddenly took the habit of sinking their teeth and claws into any passing creature, or eagles twittered as they pecked at grass seed, there would be no more rabbits or eagles. A degree of generalisation makes differentiation – types or species of beings or phenomena – possible. The more we break down barriers, the less differentiation we have. Meaning derives from the existence of, and a proper delight in, recognisable patterns.

This implies a probably unfashionable degree of essentialism. Of course, define essentialism rigidly enough and naturally it is bound to be wrong: we should never assent indiscriminately to any idea. But it is not the

same as Don Juan-like categorisation. Women – and men – are a natural kind: countesses, peasants, blond and brunette, tall and short, are not. Both hemispheres categorise, in different ways, as I have explained. But what is involved can and should be as much a matter of *recognising* reliable patterns as *imposing* a rigid uniformity. Just because we don't want to pigeonhole doesn't mean we should deny the existence of pigeons. By doing so, we wilfully blind ourselves to the forms and patterns that are everywhere in the lived world, and which give it the beautiful, orderly, richly meaningful landscape it has, rather than that of a featureless desert, filled only with identical particles of sand scattered hither and thither by every gust that blows.

THE SORCERER'S APPRENTICE

In the Introduction I mentioned the relevance of the myth of the sorcerer's apprentice. The left hemisphere thinks reality is what it itself puts together, because that is all it knows – the theoretical construct in which it lives. For it, theory trumps life. If it therefore decrees that a state of affairs shall be a certain way, then reality will, it believes, bend to the decree. Since the left hemisphere uses language to label, this often involves a belief that changing the label will change the reality. The left hemisphere takes truth to be what it says on the piece of paper.

Because there is no one fixed reality, and truth is not single or fully certain, does not mean that reality has been mysteriously abolished. That there is no one view that encompasses all truth about the world, does not mean that truth is made up, and can be whatever we want it to be. Because not all moral codes are exactly the same everywhere and at all times, does not mean that morality is a useful fiction. Because species are not fixed for all time, but flow, does not mean that I cannot tell the difference between a chaffinch and a hawk, or a lamb and a tiger, and expect reliably different behaviours from each of them. Because men and women's social roles may change from place to place and from time to time does not mean that there are no essential differences between men and women, starting in a host of embodied differences, which are neither trivial nor artificially encapsulated, and moving on to psychological differences, which may be less starkly obvious (to some), but since we are seamless beings, not mere disembodied psyches, are still neither trivial nor artificially encapsulated, and ultimately underwrite and inform their expression in social norms – though variations in how they are expressed may also be normal, given that contexts change. We may, of course, annotate the slate, but the slate is not blank.

The left hemisphere veers unstably between two unrealistic positions in what it sees as an *opposition*: either all is fixed or all must be formless flux. The right hemisphere, on the other hand, is capable of seeing that while nothing is fixed over long enough stretches of time, this does not mean that chaos ensues. There is identity over time. The mountain is flowing, yes – *always* flowing; but equally importantly it does so so slowly that from day to day, from millennium, even, to millennium, we can depend on its

massive presence: 'The mountain *sceal* stand fast upon the green earth'. As Polixenes counsels in *The Winter's Tale*:

Yet Nature is made better by no mean
But Nature makes that mean; so over that art
Which you say adds to Nature is an art
That Nature makes ...

...This is an art
Which does mend Nature – change it, rather – but
The art itself is Nature.⁶⁰

In other words, change is *always* happening organically, right hemisphere fashion, in accord with the thing itself, with its nature, with its flow, with the *tao*: not by abrupt disjunctive steps, by theory, by decree, by brute force, left hemisphere fashion.

LEVELS OF CATEGORIES

If every instance of anything was always seen as new, never quite the same as anything else (as is actually the case), we would have to start from the beginning with each encounter – which, with a leaf, for example, would be a huge waste of time, not to mention fatal with a snake. So each hemisphere does need to categorise to a degree; I have discussed the differences in strategy in Chapter 15. To remind you, the left hemisphere relies on there being a qualifying feature that makes whatever it is eligible for a certain category. If it ticks the box for that feature, it belongs to the category. ‘Wears a skirt → I know what to do’. The right hemisphere, by contrast, categorises by ‘family resemblance’.⁶¹ In other words, you can see that the elements go together and have a likeness, but there is no one feature that each element has to display in order to be a member of the category. There is a likeness in the whole, in the *pattern*. ‘No skirt, but definitely feminine.’ Appropriately enough, this hemisphere difference in pigeonholing has been demonstrated in pigeons, and is in fact basic to any intelligent creature’s knowledge of the world.⁶²

However, these two ways of categorising have different effects on the uniqueness and individuality of their constituents. The right hemisphere way does less than the left to subsume the individual case in the category, and still less to substitute the category for the individual case. By contrast, as soon as the focus is on an abstraction, a feature possessed by all members of the group, everything else about them – what makes them unique – tends to recede. (Women become just men without penises.) This is no small issue, since we are constantly categorising. Standing certain instances together in a certain place in your mind because they seem similar leaves open the question of what is similar, and why, returning the mind to be attentive to their actualities. On the other hand, placing those instances firmly in a category according to their possession of a certain attribute inevitably elevates the attribute over the whole entity to which it belongs.

Many of our frustrations with what one might call ‘machine thinking’ in the modern world are caused by the way decisions are made on the basis of whether or not something ticks the boxes, not on a feel of the whole as something essentially unique, with family resemblances to other things that

have been valued for working well. Decisions using the left hemisphere's type of categorisation can be made in the abstract – law-making; decisions using the right hemisphere's categorisation have to be made face to face, by experience – the skill of the judge in applying the law.

A further difference here between the hemispheres is that they categorise to a different degree of generalisation. The left hemisphere has highly generalised, overarching categories, while the right hemisphere has finer-grained, 'lower-level' ones.⁶³ As Stephen Kosslyn puts it, 'the right-sided subsystem comes to be more narrowly tuned, whereas the left-sided subsystem funnels a *range* of shapes into a *single* representation'.⁶⁴ What this means in real-life terms is that the left hemisphere certainly recognises 'birds', perhaps even 'waders' (handy feature: long legs), but as for the difference between a sandpiper and a snipe (both waders, neither of which actually have particularly long legs), it's over to the right hemisphere. Once again there is a tendency towards the abstract, the general and a part-wise approach in the left hemisphere (does it tick the boxes?), and towards the embodied, whole and unique in the right hemisphere. Uniqueness is, after all, the ultimate case of 'subordinate' categorisation: being in a category of one.

This ability for the right hemisphere to see uniqueness, *as well as* to understand a whole, and to remember, or manipulate complex 3-D structures in space, may partially explain why 'the right hemisphere is of much greater importance in facial discrimination and recall'.⁶⁵ Indeed, it has been suggested that faces may just be a special case of fine-grained ('subordinate') categorisation, at the point where it reaches the unique.⁶⁶ The face is an extraordinarily complex form that is always unique and yet almost identical to every other face in terms of its structure: another instance of James's carpenter's observation. Despite this we are capable of recognising a single face in a crowd, at any angle, in varying light and wearing different facial expressions, even when moving at speed.

UNIQUENESS, FAMILIARITY AND THE HEMISPHERES

Let me explore the issue of uniqueness a little further, this time more explicitly in relation to the hemispheres. It is a very important one, not only for an understanding of the nature of the world each hemisphere perceives, but for our understanding of the world at large.

Elkhonon Goldberg and his colleagues have demonstrated that there is a reliable difference between the hemispheres in terms of their handling of fresh experience. They have shown that new experience of any kind – whether it be of real-life objects, sounds, skills or imaginary constructs – engages the right hemisphere. As soon as it starts to become familiar or routine, the right hemisphere is less engaged and eventually the ‘information’ becomes the concern of the left hemisphere only. This transfer of activity can be seen on imaging.⁶⁷ It is a finding we might logically expect, because new experience tends to come from the periphery of the field of attention, and that is the province of the right hemisphere – which is, after all, on the lookout for whatever unexpected is happening, at the moment that it happens; whereas the left hemisphere is concentrating on what is already identified as of interest, known and familiar, and at the centre of the attentional field – in order to grasp it. This means that to have knowledge of something as it is fresh to experience – while it is still unique, and before it has become just ‘one of those things’ – we rely on the right hemisphere. Once the left hemisphere becomes engaged the thing has lost its uniqueness and become familiar and available. The tendency for the left hemisphere to make hyperfamiliar judgments and to fail to grasp uniqueness was discussed at some length in Chapter 6. This difference is fundamental for any conscious being trying to make sense of experience; and so it is unsurprising that the same right-left difference in respect of newness is found in animals.⁶⁸

Just as in most languages other than English we distinguish between types of knowing, referring to the different ways in which our two hemispheres ‘take in’ the world, so there are also two kinds of familiarity, which reflect these different senses of knowing. Familiar comes from Latin, *familia*, meaning one’s household, those who are close to one. One way of being familiar is to be like something else – the *type* is familiar. You might

call it ‘generalised’ familiarity. It is familiar in the way that a *cliché* or an electronic ‘icon’ is familiar. It is worn, and somewhat lacking in life. This is the familiarity that leads things to the left hemisphere. The other is almost the opposite. It is familiar precisely because it is *not* like anything else. You might call it ‘unique’ familiarity. This is the way in which your friends and family, your favourite music, is familiar – in all their difference and complexity. This is the familiarity that is bestowed by experience and the right hemisphere.

It’s not so much a matter of certain generalised *types* of materials that distinguish left from right hemisphere involvement: instead, there’s a gradient of relative hemisphere involvement across the board, depending on the degree to which the material is routine or not.⁶⁹ These differences are reflected in the way the two hemispheres relate to the autonomic nervous system, that aspect of the nervous system that is not under direct conscious control, and which regulates heart rate and respiration, blood pressure, digestive function and so on. The left hemisphere is more closely related to the parasympathetic system, which puts the body into a state of rest, whenever all is, in Nietzsche’s terms, ‘equal’ – familiar and ‘under control’. The right hemisphere is more closely related to the sympathetic system, which prepares the body to face the unknown, because it is on the alert – to whatever is not familiar, not already certain.⁷⁰

Uniqueness presents particular problems for the left hemisphere’s tool, language. Uniqueness brings everyday language to a standstill. Anything truly unique cannot be expressed in such language, which is why whatever is profound, personal, or sacred, if it is to be expressed in words, can be so expressed only in poetry, the language of the right hemisphere. In poetry, language subverts its normal tendency to precision and becomes rich with ambiguity, with potential meaning again; and through the rifts created in the enclosing veil of language the light once more streams in.

Reductionist thinking, more typical of the left hemisphere, to which uniqueness is opaque, holds that all can be accounted for by breaking things down to further, and yet further, entities. Uniqueness, however, halts analysis: it is a standing rebuke to our ever-ready categories. It cannot be accounted for in terms of its parts. That is what an individual means – an entity that cannot be further *divided*, without ceasing to be what it is. Individuals are, after all, *Gestalt* wholes: that face, that voice, that gait, that sheer ‘quiddity’ of your friend, defying analysis into parts. Once you break

everything down into parts – generosity, kindness, humour, brown hair, blue eyes, etc – you are lost in the realm of generalities only. You couldn't put her together from this information. To know her, you'd just have to meet her (quite a few times – it's a process). She is real, unique, and has extension in time (there is a history to her – she's as much a process as you are). Her analysed description is none of these things and has none of these qualities.

‘ALL THE BIRDS ARE THE SAME’

We have seen that right hemisphere lesions can lead to loss of the ability to recognise a face. Although prosopagnosia has specific neural correlates, it is an aspect of a much wider problem that the left hemisphere has in dealing with uniqueness. Numerous subjects with right hemisphere lesions have reported that they could no longer tell which street they were in, even if they had lived there all their lives: the houses had lost their individual characteristics and all looked the same.⁷¹ Theodor Landis and colleagues describe 16 cases of people who showed inability to differentiate unique, familiar surroundings, their street, house or room, from general categories of streets, houses and rooms, while still being quite capable of finding them on a map.⁷² All had posterior lesions of the right hemisphere. One said that he could

‘logically’ figure out the correct building but could not recognize it. What he did recognize were the small, distinctive features, such as the garage, mailbox, and doorway ...

Here the left hemisphere is doing its best to identify by parts – but what is required is a grasp of the whole. Another with a right hemisphere lesion reported, in addition to being unable to recognise houses and streets, an inability to recognise familiar handwriting, including her own, and the inability to recognise familiar pet animals. This confirms that we are dealing with a specific disorder of uniqueness, of recognising complex wholes, not primarily of topographical orientation.⁷³ For example, one subject with a right hemisphere lesion could no longer distinguish a peach from an apple.⁷⁴ A Swiss woman, with right hemisphere damage, whose hobby since childhood involved identifying ‘all the birds in her country’, poignantly lamented that ‘all the birds look the same’.⁷⁵ A farmer, who had always known his cows by name, could no longer tell his cows apart after right hemisphere damage, although he could just about distinguish them from a horse.⁷⁶

Landis and a colleague, Marianne Regard, reported two patients with posterior infarcts in opposite hemispheres. The patient with the right-sided

lesion, therefore relying on her left hemisphere, could read what was written in letters she received, but could not say from looking at the writing who had written them (she also could not recognise faces); the patient with the left-sided lesion, relying on her right hemisphere, could identify the handwriting immediately, but was unable to read what was written, because of course the right hemisphere cannot easily read.⁷⁷ Again, this is not just about handwriting: a person with a left hemisphere lesion could not articulate what she saw in a painting, but she knew immediately it was by Van Gogh.⁷⁸ In fact people with left hemisphere damage were found to be actually *better than normal subjects* at recognising the style of a painter, whereas the right hemisphere-damaged were grossly inferior: when asked to categorise paintings by artist, they simply categorised them by subject matter.⁷⁹

The link between, on the one hand, the left hemisphere and generalised abstraction, and, on the other, between the right hemisphere and embodied uniqueness, is demonstrated by some research by Tatyana Chernigovskaya, asking patients with temporary right or left hemisphere suppression to comment on paintings of natural scenes. The paintings chosen were by Corot (*Morning; Evening; Morning in Venice; and Windy Weather*); Monet (*Waterloo Bridge, the Effect of Fog*); Morland (*The Approaching Storm*) and Shishkin (*Before the Storm*). The researchers were interested in the accuracy and quality of subjects' understanding of the various natural phenomena (such as weather and time of day), and the way in which the subjects described the paintings.⁸⁰

Under conditions of left hemisphere *suppression*, therefore with the right hemisphere dominant, subjects proved highly accurate in interpreting concrete specifics, such as weather conditions and time of day, better even than with both hemispheres functioning. Their responses were not only accurate but rapid and concise, often coinciding (unknown to them) with the actual name of the painting (eg, 'windy weather' or 'approaching storm'). Subjects were able to discriminate the important qualities of the painting – the precise use of colour, the nuanced distribution of light and shade, and so on. And they were able to give an emotional appraisal of the picture they were describing.

However, under conditions of right hemisphere *suppression*, the same subjects showed a 'drastic' reduction in their accuracy of recognition, an inability to synthesise a whole from the parts, and a failure to distinguish

the important features of a painting. Many subjects showed an inability to point to any feature at all (one subject, for example, said of the Monet picture: 'I can't make out anything whatsoever – it's an abstract painting'; another, 'it could be the surface of the earth, or of some material, or another planet'; another, 'the surfaces seem to be concave or convex' (it is of interest that such illusions are sometimes found in schizophrenia).⁸¹ In general their responses were 'sterile, vague, and rambling', frequently having nothing to do with the picture at all. A serious effort was made by some to *categorise* the painting (the genre, the 'school', the historic period or place of execution). No adequate emotional appreciation of the pictures was made.

Chernigovskaya comments that whereas the right hemisphere underwrites the relationship between a complex painting and elements of the real experiential world, the left fits the picture into a system of conventional categories, failing either to identify the relevant features, or to provide an overarching appreciative synthesis. And as Cutting comments:

What we see here is that the right hemisphere's *modus vivendi* is to be concerned with the uniqueness of some object in the world. Its imagistic repertoire portrays a vivid scene with a time and a place, and its linguistic faculty further links a word with a definite thing. The left hemisphere, on the other hand, can barely provide images of anything definite, even though it can adequately construe what sort [category] of thing it is presented with.⁸²

Thus, the left hemisphere seems biased to registering perceptual information more abstractly, perhaps even limited to generic, categorical information, such as prototypical features, and discarding unique information that does not generalise across the linguistic category.⁸³ As previously noted, generating unique rather than common responses shows greatest activation in the right temporal pole.⁸⁴

Pallis reported in detail the case of a man with a right posterior cerebral artery infarct, who told him:

I found out all faces were alike. I couldn't tell the difference between my wife and my daughters. Later I had to wait for my wife

or mother to speak before recognizing them. My mother is 80 years old ... I have difficulty in recognizing certain kinds of food on my plate, until I have tasted or smelled them. I can tell peas or bananas by their size and shape ... I bought some copies of *Men Only* and *London Opinion* ['girlie' magazines]. I couldn't enjoy the usual pictures. I could work out what was what by accessory details, but it's no fun that way. You've got to take it in at a glance ... It's when I'm out that the trouble starts. My reason tells me I must be in a certain place and yet I don't recognize it. It has to be worked out each time. [85](#)

Pallis notes that his patient had difficulty, not just with human faces, but with animal faces and forms, too. He had to resort, left hemisphere fashion, to analysis by *parts*: 'A goat was eventually recognized by its ears and beard, a giraffe by its neck, a crocodile by its dentition, and a cat by its whiskers'. Most fascinatingly of all, while he had difficulties with faces, animals, food, pictures and places, he did not with matters of *utility*. 'He readily recognized individual items of cutlery, glassware, furniture, garden tools, or other objects in everyday *use*.'

SACKS'S DR P AND CONTEMPORARY COGNITIVE SCIENCE

One is forcibly reminded of the case of Oliver Sacks's 'Dr P', the 'man who mistook his wife for a hat': his doing so was, of course, a consequence of inability to read or recognise faces. He knew the Platonic solids, and other regular bodies, like the back of his hand.⁸⁶ Such regular solids, being easily categorised and typical, are accessible to the left hemisphere in a way that complex, irregular and unique forms found in nature are not.⁸⁷

It was quite another matter, however, when it came to faces. Dr P tried to understand them as if they were abstract puzzles: and, even when he knew they were faces, could not recognise their identity or understand their expression or intention:

He did not relate to them, he did not behold. No face was familiar to him, seen as a 'thou', being just identified as a set of features, an 'it'.

In describing pictures, Sacks comments that Dr P failed to see the whole, seeing only details; he confabulated non-existent features; he exhibited partial left field neglect; and confused animate and inanimate, eg, his shoe for his foot. However Dr P himself 'seemed untroubled, indifferent, maybe amused'): his chirpy insouciance is also in keeping with right hemisphere damage. When asked what is the matter, he replies – 'with a smile' – 'Nothing that I know of ...'

As Sacks reflects,

abstract shapes clearly presented no problems. What about faces? ... He approached these faces – even of those near and dear – as if they were abstract puzzles or tests. Thus, there was formal, but no trace of personal, gnosis. And with this went his indifference, or blindness, to expression. A face, to us, is a person looking out – we see, as it were, the person through his *persona*, his face. But for Dr P. there was no *persona* in this sense – no outward *persona*, and no person within ...

Presented with a flower, and asked what it is, Dr P replies:

‘Not easy to say.’ He seemed perplexed. ‘It lacks the simple symmetry of the Platonic solids, although it may have a higher symmetry of its own ... I think this could be an inflorescence or flower’ ... He saw nothing as familiar. Visually, he was lost in a world of lifeless abstractions.

Indeed, he did not have a real visual world, as he did not have a real visual self. He could speak about things, but did not see them face-to-face ... [Dr P] functioned precisely as a machine functions. It wasn’t merely that he displayed the same indifference to the visual world as a computer but – even more strikingly – he construed the world as a computer construes it, by means of key features and schematic relationships. The scheme might be identified – in an ‘identikit’ way – without the reality being grasped at all ...

His paintings, originally ‘naturalistic and realistic, with vivid mood and atmosphere, but finely detailed and concrete’, became ‘far more abstract, even geometrical and cubist’. Finally, in the last paintings, the canvasses became ‘mere chaotic lines and blotches of paint’. Dr P’s wife calls Sacks a philistine because he cannot see the change as an increase in artistic *development* – renouncing the realism of his earlier years, he had, she thought, advanced into abstract, nonrepresentational art. “‘No, that’s not it”, I said to myself ... This was not the artist ... but the pathology, advancing – advancing towards a profound visual agnosia, in which all powers of representation and imagery, all sense of the concrete, all sense of reality, were being destroyed’.

These many changes are all in keeping with right hemisphere impairment.⁸⁸ And there is one further detail that is interesting. His wife recounts that he can get dressed, eat and bathe, only while singing to himself: and, if he is interrupted or otherwise loses the thread, he grinds to a complete halt, ‘doesn’t know his clothes – or his own body ... He can’t do anything unless he makes it a song.’

Music is, after all, something that flows, is integrating, has its own momentum or life, and is indeed a deep image of life itself. It was drawn on

by Dr P as a lifeline: the one unifying force that he could summon from his dysfunctional right hemisphere.

Sacks does not in fact specify which hemisphere is damaged, as he was not able to follow up the case. But even if there were not here such a classic array of phenomena suggesting right hemisphere damage, there are two further clues.

The great Russian neuropsychologist Aleksandr Luria made a famous case study of a soldier, whom Luria called simply 'Zasetsky', who had sustained a penetrating injury to the left occipital lobe. Sacks recalls that the soldier might not have been able any longer to play games, but that the vividness of his imagination had remained unimpaired. He comments that Luria's patient and Dr P lived in worlds that were 'mirror images' of one another. And he remembered Luria's words: that his patient fought to regain his lost faculties 'with the indomitable tenacity of the damned' – whereas Dr P 'did not know what was lost, did not indeed know that anything was lost. But who was more tragic, or who was more damned – the man who knew it, or the man who did not?'⁸⁹

The soldier with the left hemisphere damage was distressed, but lived in the real world, where he was aware of what he had lost, and his imagination was intact. Dr P lived in a world that was its 'mirror image', the consequence of right hemisphere damage – and didn't know what it was he didn't know.

The other clue to hemispheric involvement lies in a postscript Sacks appended to his account of Dr P. He refers to having subsequently stumbled on an earlier report which he describes as 'indeed identical neuropsychologically and phenomenologically'.⁹⁰ This case, reported by Macrae and Trolle in 1956, had a left homonymous hemianopia, strongly suggesting a right parietal lesion, but unfortunately in the 1950s there was of course no CT or MRI, and X-ray investigations were inconclusive (the authors suggest it is safest to conclude damage to both parietal regions). However, this patient had what we now know to be a litany of problems dependent on damage to the right parietal region:

- no depth perception;
- 'tunnel vision' (2 degrees out of 360);
- inability to see, or visualise in his imagination, faces (including of himself, his family, his friends or the US president);

- inability to see, or visualise in his imagination, animals, or ‘animate objects’ of any kind (though he could recognise simple everyday objects *of use*, such as a bicycle, an iron, scissors, a kettle, a watch and a key);
- inability to tell a cow and dog apart, except by size;
- inability to imagine colours if they did not fit the stereotype (eg, he could imagine green grass, but not brown grass – when reminded of the brown grass of California, he could not visualise it);
- inability to recognise his wife in a public place unless she wore a striking identifying feature, such as a large hat;
- inability to recognise his own image (though he knew that he had three identifying features – black hair, a receding hairline and a black mole on one cheek – and this was the only way he could know it might be himself).

According to Macrae and Trolle, he also ‘tended to belittle his defects of vision or explain them away’. Some feat, as I imagine you will agree, even for the left hemisphere’s Mr Micawber.

Sacks concludes with a reflection which is highly germane to the thesis of this book – a reflection on the current state of cognitive science. He draws attention to the fact that human cognition is never just abstract and mechanical, but must be personal as well. As such, it involves not just calculating and categorising, but feeling and judging, and that this is *essential* to our humanity. If this is missing, says, Sacks, we become more like computers: in this we are not dissimilar to Dr P. And, to the extent that we eliminate feeling and judging, the personal, from the cognitive sciences, we ‘reduce them to something as defective as Dr P – and we reduce our apprehension of the concrete and real’:

By a sort of comic and awful analogy, our current cognitive neurology and psychology resemble nothing so much as poor Dr P! We need the concrete and real, as he did; and we fail to see this, as he failed to see it. Our cognitive sciences are themselves suffering from an agnosia essentially similar to Dr P’s. Dr P may therefore serve as a warning and parable – of what happens to a science which eschews the judgmental, the particular, the personal, and becomes entirely abstract and computational.⁹¹

Quite. These words, written in 1985, some 35 years ago, are truer now than ever, and apply not just to science, but to society as a whole. Sacks was able to make the connexion between the psychopathology of an individual psyche and that of a culture – something, as I have discovered, that seems to flummox more literal minds.

SHOULD YOU BE YOUR 'SELF'?

Finally I want to turn to a paradox that concerns not just the world experienced by consciousness but the nature of the individual consciousness doing the experiencing. Hopkins says that each thing 'selves'. Yet he was a priest; and, in every spiritual tradition, we are recommended to turn away from the self, even to cultivate a condition of 'no-self'. Is the self, then, something to celebrate, or to deny? And if it is the purpose of the lives of other creatures to fulfil that self, should it really be ours to stifle it? Is it a regrettable illusion, that it is our life's work to expunge; or is it, on the contrary, the purpose of our existence to find it, grow it and fulfil it? And what do spiritual masters mean when they say that the self is, even, an illusion? ⁹²

Of course even a spiritual master has a body that is distinct from other bodies, a birth, a life history and a death that is unique. We are separate physical entities in different locations in space and time. There are, as I have suggested, many senses in which we share our identity with others: we are social beings who co-create one another and the world. But however we become aware of and cultivate intersubjectivity, however empathic we become, there must always be differences in our bodily experiences and feelings, formed of a personal history, and we cannot dismiss those experiences and feelings as illusory because they are at the very ground of who we are. The tendency to deny reality to the realm of experience (which is always personal) is contagious and one soon finds oneself reaching the unfortunate conclusion that *everything* has to be an illusion – including, presumably, our belief that everything is an illusion; and leading to the question who suffers from the illusion, if we don't exist, and what reality is it that we are deceived about. Indeed, given the illusion, why should we concern ourselves with anything at all?

Often what seems to be being claimed is not so radical. It is that the self in the sense in which many people (particularly now in the West) unreflectively conceive it is a misleading concept. The self, it is being claimed, is neither as separate from other selves, nor as static and unchanging, as it is often thought to be. These claims seem to me to be far more interesting than the more absolute, less finely articulated, claims, and

have the considerable additional merit that they don't undermine the reality and urgency of what they help us see.

In the discourse of spirituality it is sometimes mistakenly assumed that the contradictions between 'no-self' and self can be resolved by declaring the first to be true and the second an illusion. However, by neglecting the other 'arm' of the dipole we create difficulties in understanding – difficulties that are not, however, overcome by merely recognising the need for both in some additive sense, rather through a synthesis that creates something new and beyond what was in either of the alternatives identified. 'We have to learn, so to speak, to get out of our own light', wrote Aldous Huxley; and yet 'we must not abdicate our personal, conscious self.'⁹³

The apparent conflict between self and no-self parallels that between the One and the Many; and between changelessness and eternal flow on the other. When people say to me, 'All is One', I readily agree. 'And All is Many', I add: 'now what?' As Suzuki says, 'the secret of Sōtō Zen is "yes, but".'⁹⁴

The claim that All is One is well-intentioned, but, it seems to me disastrous, because it is just *half* a truth. We sense that we are not as separate as our everyday manner of thinking implies, and that is wonderful. But the impulse to simplify causes problems – because the other equal truth is All is Many. I would suggest that this attempt to have it one way or the other comes from the left hemisphere's urge to resolve what it sees as a contradiction. In Buddhism, writes Jane Hirshfield, 'non-duality is not the negation of multiplicity in favour of some idea of the absolute; it is also not the nihilism so many Westerners think Buddhism to be.'⁹⁵

'All is One' and 'All is Many' to the left hemisphere demands an either/or resolution. For the right hemisphere it is a differently structured problem, since, for it, what one might call differentiated wholes – not created by an effort of cognition, so much as by one of recognition – are all that there is. Precisely because the left hemisphere sees what amount to geometric abstractions, and categories, that are snatched from time and embodiment, its analytic bent leads to an abstract, eternally unchanging unity of perfect forms: all uniqueness lost. By contrast, the right hemisphere sees a fractal or holographic world, a multitude of individually unique wholes, or *Gestalten*, that themselves form part of an ever greater *Gestalt*, which is filled with implicit differentiation, not just unitary.

When it comes to understanding the self, one can predict that each hemisphere will support a different version. The self as conceived by the left hemisphere, should be – and is – an entity that is relatively static, separate, fixed, yet fragmentary, a succession of moments, goal-orientated, with its needs at any moment perceived as essentially competitive (since others may similarly target the same resources), determinate, consciously wilful, circumscribed in the breadth and depth of what it sees, at ease with the familiar, certain and explicit, but less so with all that is fluid, ambiguous, and implicit, and unaware of the limitations of its own knowledge. The self as conceived by the right hemisphere should be – and is – more akin to a process than a thing, essentially fluid and less determinate, nonetheless forming a unique whole over time, aware that it is fundamentally inseparable from all else that exists, open to others and to experience, more concerned with co-operation than competition, less consciously wilful, more engaged in what one might call ‘active passivity’ (an open attendant disposition, in which one is ready to respond to what emerges), seeing the greater picture in space and time, and aware of the extent of its ignorance.⁹⁶

In other words, the self as intrinsically inseparable from the world in which it stands in relation to others, the social and empathic self, and the continuous sense of self, with ‘depth’ of existence over time, is more dependent on the right hemisphere;⁹⁷ whereas the objectified self, the external self, and the self as an expression of will, is generally more dependent on the left hemisphere. This seems to me to reflect the distinction made by Jung between the self (here RH) and the ego (here LH), fulfilling different, but necessary, functions. For him, the self is the product of psychic integration over time and unites conscious and unconscious processes, while the ego is that part of the self identified with the conscious will, and which, though necessary in the earlier stages of development in order to anchor the growing individual in the world, comes to be transcended in the process of spiritual growth. In being transcended it is not abolished, but changes its nature by being taken up into a new whole where its role is altered. As Cynthia Bourgeault points out:

The egoic selfhood does not go away; rather, it becomes a good servant. It’s still a very useful tool for many of the functions we are called on to perform in this world. But it is now ‘transcended and

included'; we recognize that it is a modality of action and not the seat of our identity.⁹⁸

In its proper place, no longer master but faithful servant, it comes to perform a useful function. It can be redeemed: transcended but included. We would not be better for its non-existence. This is Flint as embraced by He Grasps the Sky With Both Hands.

It seems that we should not fail to fulfil our selves but precisely in doing so come to transcend the narrow sense of the self, the one that holds that we are radically distinct rather than intrinsically connected. When Emerson advised that 'the man who renounces himself, comes to himself',⁹⁹ he did not, surely, intend that the sense of the self should be lost: rather that it should be transformed. Provided that is understood, we need to nurture, not destroy the self. Indeed, in order to empathise with others and incorporate their experiences into our own – to forget ourselves in knowledge of them – *we require an intact sense of self.*¹⁰⁰

Perhaps, then, All is One – and All is Many. That is a central insight of Bergson's philosophy and given expression in his view of time – a phenomenon which, as we have seen, the right hemisphere seems far more capable of understanding than the left.¹⁰¹ William James shared Bergson's insight:

It is the general conceptualist difficulty [as represented in the LH] of any one thing being the same with many things, either at once or in succession, for the abstract concepts of oneness and manyness must needs exclude each other ... The concrete pulses of experience [RH] appear pent in by no such definite limits as our conceptual substitutes for them [LH] are confined by. They run into one another continuously and seem to interpenetrate. *What in them is relation and what is matter related is hard to discern.* You feel no one of them as inwardly simple, and no two as wholly without confluence where they touch. There is no datum so small as not to show this mystery, if mystery it be. The tiniest feeling that we can possibly have comes with an earlier and a later part and with a sense of their continuous procession.'¹⁰²

I earlier quoted Bergson's observation that we can move from an insight to analysis, but not from analysis to insight. The broad and flexible can see the value of being narrow and rigid at times, whereas the narrow and rigid, by definition, can only see the value of being narrow and rigid.

James is a pluralist, an articulate advocate for the reality of individuation in the face of the common philosophical drive for generality. Talking of what he calls the 'each-form', the result of individuation, which is brought about by evolution (evolution here in the broadest sense, not just biological or Darwinian evolution – though that would be included in it – but the progressive differentiated unfolding of reality through the agency of time), he not only rebuts the charge that such a process leads to loss of order, but claims that, compared with the 'all-form' preferred by monists, the differentiated world brought about by time has a greater, and more fruitfully complex, order – one that is pregnant with possibility:

Monism thinks that the all-form or collective-unit form is the only form that is rational. The all-form allows of no taking up and dropping of connexions, for in the all the parts are essentially and eternally co-implicated. In the each-form, on the contrary, a thing may be connected by intermediary things, with a thing with which it has no immediate or essential connexion. It is thus at all times in many possible connexions *which are not necessarily actualized at the moment ...*

And, in a passage that seems to define not just phenomenological reality, but the very structure of the synaptic brain and nervous system, he continues:

Our 'multiverse' still makes a 'universe'; for every part, tho it may not be in actual or immediate connexion, is nevertheless in some possible or mediated connexion, with every other part however remote, through the fact that each part hangs together with its very next neighbours in inextricable interfusion. ¹⁰³

RESOLVING THE ONE AND THE MANY

Schelling says that there is no higher revelation in all of science, religion or art, than that of the divinity of what he calls the 'All'; but this comes on the back of his recognition that each sphere of intellect and spirit – science, religion and art – sees something particular and special. In those ages, he warns, where we are mindful of this unity, a culture enjoys vigour, and vitality, and the fruits of the collaboration of the arts and sciences: but the price of losing that vision is the loss of everything we value. We struggle, he says, to put things together, adding grain of sand to grain of sand. Unsurprisingly the left hemisphere, having dismantled the universe, it is at a loss to know how to put it together again.

So now we see the Many, but no longer the One. In Eastern thought (and the same can be found in Hegel, Heidegger and other thinkers of the Western tradition), there has always been an important dialectic between the figure and the ground in which it is set, between the distinguishable and the whole of which it is one element, between the specifiable (because limited) and the unspecifiable (because infinite) context which qualifies it. In the *Bhagavad Gita*, Lord Krishna advises Arjuna:

When one sees Eternity in things that pass away and Infinity in finite things, then one has pure knowledge. But if one merely sees the diversity of things, with their divisions and limitations, then one has impure knowledge. [104](#)

CONCLUSION

Whatever is general lies outside time and has no place in space. Whatever exists in time and space is *ipso facto* unique; though in it and through it one sees the general and the timeless, not as separate, but as another facet of the same entity. What is unique at one level is general at another; what is general at one level is unique at another. Thus, the pair of phenomena is coincident: ‘*not again nor later but at the same time* it forms and dissolves, and approaches and departs.’ We need both, and each gives rise to the other, not in sequence but simultaneously. Once again, the opposites that are indicated by the One and the Many, the unique and the general, remain opposite, while being nonetheless coincident; and hence generative.

Note that both the uniqueness of the individual case *and* the oneness of the whole are dependent for their appreciation on the right hemisphere. The left hemisphere substitutes membership of highly generalised categories for uniqueness, and then tries to achieve a sense of the whole by aggregating these categories. It is part of the unifying disposition of the right hemisphere to see similarity within difference, and part of its capacity for fine discrimination to see difference within similarity, whereas the isolating disposition of the left hemisphere sees similarity and difference as a simple opposition, at loggerheads with one another.

However, there is a role here for the left hemisphere – provided, as always, its contribution is in service to that of the right.

In these first two chapters of Part III, I have tried to illuminate the *processes* that bring into being, and give form or structure to, reality. In the subsequent chapters I will examine various *aspects* of that reality: time, flow, space, matter, consciousness, value, purpose and the sense of the sacred.

William James asked, in relation to the question of unity and multiplicity, why ‘should the absolute ever have lapsed from the perfection of its own integral experience of things, and refracted itself into all our finite experiences?’ ¹⁰⁵ It’s a very good question.

Grant that the spectacle or world-romance offered to itself by the absolute is in the absolute’s eyes perfect. Why would not the world

be more perfect by having the affair remain in just those terms, and by not having any finite spectators to come in and add to what was perfect already their innumerable imperfect manners of seeing the same spectacle? Suppose the entire universe to consist of one superb copy of a book, fit for the ideal reader. Is that universe improved or deteriorated by having myriads of garbled and misprinted separate leaves and chapters also created, giving false impressions of the book to whoever looks at them? To say the least, the balance of rationality is not obviously in favour of such added mutilations. So this question becomes urgent: why, the absolute's own total vision of things being so rational, was it necessary to comminute it into all these coexisting inferior fragmentary visions?¹⁰⁶

Asking this searching question begs another intimately related question: why the timeless could or should ever have given rise to time. In the chapter that follows, I will turn our attention to the question of the nature of time, and ask if the hemisphere hypothesis can help us come to a closer understanding of this mysterious element in experience.

TIME

Space and time can never be mere side-shows in philosophy. Their treatment must colour the whole subsequent development of the subject.

—*Alfred North Whitehead*¹

What, then, is time?

—*St Augustine*²

I do not define time ... as being well known to all.

—*Isaac Newton*³

‘THESE QUESTIONS ABOVE ALL FORCE THEMSELVES ON THE SPECULATIVE mind’, wrote Schopenhauer in 1819:

What is *time*? What is this being that consists in nothing but movement, without anything that moves? and, What is *space*, this omnipresent nothing, out of which no thing can emerge without ceasing to be something? ... To think away time and space is completely impossible, while it is very easy to think away

everything that appears in them. The hand can let go of everything, except itself.⁴

In the next few chapters I will be trying to come to some kind of understanding of this, in itself ungraspable, ground of our being in time and space, to grasp the hand that can let go of everything but itself. At any rate, as in the approach to all deep questions, at least to see more clearly what it is we now believe that is unlikely to be the case. And in this chapter it is specifically to time that I will turn.

Asking humans about time is like asking fish about water. In order to get a handle on something as tasteless, colourless and odourless as time, it is helpful to see what time is *not*. I earlier emphasised the consequences of distortions of time in schizophrenia: as the fish discovers the true value of water only when it is tossed up on the shore, we find out how necessary time is only when we lose all sense of it. Time is our home, and indeed death is our friend: the attempt to flee from either of them, as we do in the modern Western world, is not just doomed to fail, but to thwart a fulfilled and fulfilling life. I also believe that the philosophical positions that time is an illusion, or that it is in reality stationary (which amounts to the same thing), or is composed of moments or slices, entail philosophical mistakes with far-reaching consequences. They are, in effect, forms of delusion.

Before going any further, I should make it clear that naturally I do not pretend to do justice to a debate on the nature of time which has long preoccupied, and continues to preoccupy, philosophers and physicists, and, assuming time to be real, will carry on doing so for a long time to come. I have merely a different light to cast on the debate which might prove useful. What strikes me is that the debate centres on a nexus of issues that have definite hemisphere correlates: the difference between *representations* of experience and experience itself; between stasis and flow; between points of time and time as duration; between predictability and uncertainty; and between closedness and openness. If you have accompanied me so far in the book, you will know that, in each of these cases, the first is more associated with the left hemisphere and the second with the right. These elements, with the emphasis at times in different places, are commonly at the heart of many philosophical disagreements. What I can offer here is, as always, just one more perspective, but it is one on the basis of which two claims might be made.

One, the weaker one, is that these philosophical differences are to be expected, since they represent the difference in experience of the two hemispheres, and each provides a take on reality. Since our consciousness cannot be separated from the experience of time on which any debate is predicated, the division is natural.

But there is another, stronger, claim to be made, which depends on a view I have argued for throughout this book and its predecessor, namely that while each of the differing ‘takes’ on reality of the two hemispheres has value, their value is asymmetrical. If you are with me so far, you will want to see the need for both takes, but ultimately give priority to the take of the right hemisphere. I believe there is something other than the contents of our own minds to which each of us aims to be true – and the right hemisphere is, on any account we can advance, a better witness to that reality than the left. Because the left hemisphere is less perceptually based, more theoretically based, and because it tends to focus on what it brings to the foreground – in this case, time – without awareness of the background that alone makes a foreground possible – in this case, consciousness – the ‘unreality of time’ position looks like it just could be another mess the left hemisphere has got itself into.

There are further grounds for preferring the right hemisphere take that are particular to the nature of time. As I have already demonstrated (in Chapter 2), the right hemisphere is far more ‘geared’ to the appreciation of time than is the left – I will not repeat that evidence here. This particular asymmetry is not surprising since spans, whether in space or time, are better comprehended by the broad attention and more extensive working memory of the right hemisphere. It is also not surprising because the right hemisphere is the hemisphere that is more in touch with reality: as usual, when the left hemisphere cannot grasp something, its reaction is to deny its existence. And we see this in relation to time. We saw it at the phenomenological level in our exploration of schizophrenia and autism (Chapter 9); and at the metaphysical level in examining the paradoxes of Zeno (Chapter 16). In both cases time ceases to function. In both cases life and the world become incomprehensible and grind, in every sense, to a halt.

In what follows I will contrast two, in their own terms coherent, views of time – though, as I shall suggest, only one can be considered a view of time at all.

In one, time is a thing, to be grasped and – if only! – fixed, a commodity that diminishes as it is allowed to pass away; in the other, a process of becoming, to be inhabited and let go. In the first, time is frozen, and spatialised in its re-presentation by the analytical intellect and by language, delivering a world which is sliced and fragmented; in the second, it is forever presencing to our intuition and our embodied cognition, where it delivers a seamlessly integrated reality which cannot be divorced from value and from purpose. In the first, time is effectively denied, and life drained of meaning; in the second, both time – and, with it, life – are affirmed and celebrated.

TIME IS NOT A THING

A misunderstanding of time lies at the heart of modern culture, affecting what it means to be a living being; and it is to do with the reification of time. Conceptualising time immediately puts one on the outside of the experience, rather than being within it, the standpoint alone from which it can be understood. As a result, time is spatialised in our intellect and inevitably immobilised: and it becomes a thing. By the very act of conceiving it, we place *time itself already outside time*.

Time is no thing. In the thing-ridden left hemisphere world, it is a short step from being no thing to being nothing. But in reality time is more real than mere things could ever be. Time is adverbial, if it is anything that grammar recognises; an aspect of being (itself a verbal noun, or gerund) or of *Dasein* (also a gerund). Time is not separate from events or experience, and like love, which is also no thing, is revealed in and through events – it is itself an *aspect* of experience: it is, in other words, as I say, adverbial, not substantive. Friedrich Waismann says of time: ‘The more we look at it the more we are puzzled: it seems charged with paradoxes ... But isn’t the answer to this that what mystifies us lies in the *noun* form ‘the time’? ... We are trying to catch the shadows passed by the opacities of speech.’⁵

It seems to me that Einstein is here stating a similar insight:

Spacetime is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not *in space*, but these objects are *spatially extended*. In this way the concept ‘empty space’ loses its meaning.⁶

That is something I shall return to in a subsequent chapter when discussing space, but since space and time, however different they may and must be, are never entirely separable, we might be best to say of objects, similarly, that they are *temporally extended*, rather than existing *in time*. Time actually means something ‘stretched’: the Latin word for time, *tempus*, derives from a root meaning to ‘stretch’ in space like a string.⁷

Its status as a noun goes hand in hand with turning it into a thing. Abraham Heschel, in his classic meditation on time, *The Sabbath*, wrote:

We are all infatuated with the splendour of space, with the grandeur of things of space. Thing is a category that lies heavy on our minds, tyrannizing all our thoughts ... Reality to us is thinghood, consisting of substances that occupy space; even God is conceived by most of us as a thing. The result of our thinginess is our blindness to all reality that fails to identify itself as a thing, as a matter of fact. This is obvious in our understanding of time, which, being thingless and insubstantial, appears to us as if it had no reality.⁸

And he continues, in a fascinating observation,

there is no equivalent for the word ‘thing’ in biblical Hebrew. The word ‘*davar*’, which in later Hebrew came to denote thing, means in biblical Hebrew: speech; word; message; report; tidings; advice; request; promise; decision; sentence; theme, story; saying, utterance; business, occupation; acts; good deeds; events; way, manner, reason, cause; but never ‘thing’. Is this a sign of linguistic poverty, or rather an indication of an unwarped view of the world, of not equating reality (derived from the Latin word *res*, thing) with thinghood?⁹

As the reader knows, I think there is something the matter with things – or at least with the way in which we conceive them. Because even ‘things’ have changed their significance with the evolution of the West. Since the rest of this book is devoted to what I take to be the foundational elements of the world we know, and since time is the first great example of how thingness can lead us astray, now is the time to take a look at the nature of things.

Heschel’s account of the word *davar* is far from being a comment on Hebrew alone. For the word ‘thing’ in English also derives from a remarkably similar array of uses. In Old Saxon it meant an assembly for judicial or deliberative purposes, conference, transaction, matter, or affair; and similar meanings are found in the evolution of the German, Dutch, Norwegian, Swedish and Icelandic terms for thing. The tenth-century

Icelandic parliament, said to be the oldest of its kind in the world, was called the Althing. In Old English the first meaning of ‘thing’, dating from the seventh century, was a judicial and deliberative assembly; hence, by the year 1000 AD, a *matter* (which contains the same ambiguity) brought before a court, and by extension an affair (literally the verbal phrase *à faire*, something ‘to do’) with which one was concerned. The root ‘thing’ can also mean a *cause*, both in the sense of the ground or reason for doing something, and in the sense of a cause that one pleads before a court, or a ‘good’ cause to which one is dedicated. Hence in French *chose*, and in Italian and Spanish *cosa* (from Latin, *causa*, a cause).

To begin with, then, a thing was not something fixed, isolated and inert, but something to be consensually decided; not certain (*certus* = already decided), but yet to be determined; not static, but moving – a process arising from the coming together of more than one party – just like Heschel’s ‘advice, request, promise’.

The Greek word for a thing, *πρᾶγμα* (*pragma*), meant originally an action, a deed (hence our ‘pragmatic’), from *πράττειν*, to do, hence an ‘affair’ or matter of concern. Plato and Aristotle are responsible for its conversion into a concrete thing that is implicitly, or explicitly, ‘real’. Until then such meanings were reserved to *χρῆμα* (*chrēma*), ‘a necessity’, and *κτῆμα* (*ktēma*), ‘a possession’. The Latin word for a thing, *rēs*, also meant an issue or matter of concern, which is why formal letters are often headed *re* (originally *in rē*), meaning ‘in the matter of’ (whatever it may be).

In Chinese, the present word for a thing, *dōngxī*, literally means East-West, and though no one etymology has been established, it is thought that this might have originated, relatively late, in the market place, where material goods were traded across continents. However, an earlier word *wù shì*, contains the idea of ‘matters’ of an intangible kind (*shì*), and could also mean ‘story’.¹⁰

What one sees in all this is that the concept of things seems to emerge historically from the nexus of deeds and affairs: things are then the elements of the picture that stand forth as being of particular concern to us. Even things were not always very thing-like, you might say, in the modern sense. They were in fact *reciprocal indeterminate processes that took place – in time*. Not only is time not a thing, but things are events in time.

This excursion into the history of our concept of things tends to support the view that I have argued for, that things are secondary properties of

phenomena that emerge out of the web of experience, as ‘objects’ that attract our focussed (left hemisphere) attention. In fact an object is just that: it becomes an object by being the focus of a certain kind of foregrounding, isolating, immobilising attention (Latin *objectus*, ‘thrown against’). It is what presents itself as useful to grasp. This is what I believe Nietzsche meant by saying that ‘the “being” of things has been *inserted* by us (for practical, useful, perspectival reasons)’. [11](#)

THINGS ARE SECONDARY TO PROCESSES

Thing-ness sounds like a celebration of embodiedness, of earthiness – what am I saying? – of the *body*, of the *earth*. Not so. For a start, as that sentence demonstrates, it can be in the service of a form of mental abstraction. Thing-ness could even be seen as beginning in something as remote as a grammatical shift, which is less surprising when one considers that words help shape our conscious apprehension of the world. It is an accident, or rather a characteristic, of Greek grammar that gave us the definite article. This has the potential to turn adjectives into nouns. No longer are there only beautiful experiences – mountains, statues, poems or people that are beautiful (κάλοι). There is now such a thing as ‘*the* beautiful’ (τὸ καλόν) – namely, beauty. This is not true of all languages: for example, there are very few abstract nouns in Japanese to this day, and no established method for their composition:

Japanese does not get along well with abstract nouns. In fact, Japanese has far fewer abstract nouns than does English, and to a surprising degree. Ōno [the distinguished Japanese historian of language and philosopher, Susumu Ōno] reports that even abstract nouns for such basic concepts as right and wrong did not exist in old Japanese ...¹²

As a result, the Japanese have nothing that corresponds to the Platonic Idea, and in fact no true abstractions in general: they have never developed the dichotomy between the phenomenological world and the world of ideas.¹³

OK, you may say, but that just concerns abstract nouns. What about what we call concrete nouns? The mountains, statues, poems or people that were found to be beautiful? In what sense are they *not* things?

But as good a question as it is, in what sense *are* they things? A thing suggests permanence, and separation from what surrounds it. But that is all a matter of the timescale you happen to adopt. Entities that change fast we see as processes; entities that change slowly we see as objects. By any cosmic scale, the mountain that erupts, flows, sediments, then erodes has

only boundaries of convenience, and permanence for a short while: as does, much more obviously, the statue, the poem or the person. It is really true that *everything flows*.

THE SPATIALISATION OF TIME

The conceptualising mind can deal with time only as a line in *space*. Julian Jaynes thought the spatialisation of time inevitable: ‘You cannot, absolutely cannot think of time except by spatialising it’, he wrote. ‘Consciousness is always a spatialisation in which the diachronic is turned into the synchronic, in which what has happened in time is excerpted and seen in side-by-sideness.’¹⁴ That is to say, automatically outside of time. Here Jaynes’s ‘consciousness’ is the left hemisphere at work, which sees only time deprived of duration, projected at an instant as a single point, line or plane, become in his phrase synchronic – by contrast with diachronic time, duration, as given to the right hemisphere.

Speech is the mode of operation *par excellence* of the left hemisphere. In order to *speak about* time we are obliged to spatialise it, and this is so normal that most people are not even aware of the process and cannot imagine trying to avoid it. It obtrudes on our attention only when we encounter a culture that spatialises time in a different way.

Predominantly linear representations of time are a feature of Western societies, though the church calendar, with its recurring celebrations tied to the cycle of the seasons and their gifts, once acted as a living, unifying, counterpoint.¹⁵ Time is no longer impressed with the circular shape that seasons – blossom, flower and fruit – and the cycle of the generations, born, marrying and dying within a community, made tangible. Circular time is collective time, time that binds us and the living world together, and its metaphysical representations go beyond the life of a single individual. Linear time is individual time and it is physically represented by an arrow flying ineluctably from the past to the future. Projected onto a society, it generates the myth of progress.¹⁶ While both circular and linear representations of time can be found in most cultures, Chinese, Indian and Native American societies have predominantly circular representations of time. (This could be, and has at times been, misunderstood as meaning that they involve mechanistic repetition, which is not the case.)¹⁷ Indeed most cultures use the metaphor of a spiral or wheel, based on the cyclical seasons, rather than positing that the Earth has a creation and a future ending, with ‘progress’ in between.

Circular time is the time of the body with its many rhythms, the time of nature's seasons, and of the rise and fall of civilisations. The shape of circular time made our relationship to one another and to the world porous, rather than, to use the term employed by Charles Taylor in *A Secular Age*, 'buffered': we were at home in the world, dwelling in it, rather than skating over it for a while on our simple linear path.

The effects of time on the surfaces of the world enabled us somehow to sink into it, they were, also *porous* to us. We no longer rest deeply in places any more but glide across their smooth, repellent surfaces, both the spatial ones and the temporal ones. The buildings we now make, though unlikely to last as long as the stone temples of the Ancient World, seem to defy time, unable to age gracefully: their concrete, steel and glass either defiantly pristine or (eventually) dirty, scratched, covered in grime and ageing disgracefully. It is this aspect of modern architecture that the Finnish architect Juhani Pallasmaa has written about in *The Eyes of the Skin*, and resisted in his own work.¹⁸

We have always loved old stone or wooden surfaces; and ultimately the pleasure we take in them is the tangible demonstration of the flow of time. Far from diminishment of the human, they are testimonies to what great things can be done by humans in keeping with time – though always ultimately respecting it, and yielding to it. We see there the triumph of process over stasis, of the *memento mori* over the man-made monument. And here, in his great prose poem on the subject of time, is Proust evoking the deep timelessness of the time-ravaged church at Combray:

How I loved our church, and how clearly I can see it still! The old porch by which we entered, black, and full of holes as a colander, was worn out of shape and deeply furrowed at the sides (as also was the font to which it led us) just as if the gentle friction of the cloaks of peasant-women coming into church, and of their fingers dipping into the holy water, had managed by age-long repetition to acquire a destructive force, to impress itself on the stone, to carve grooves in it like those made by cart-wheels upon stone gate-posts which they bump against every day. Its memorial stones, beneath which the noble dust of the Abbots of Combray who lay buried there furnished the choir with a sort of spiritual pavement, were themselves no longer hard and lifeless matter, for time had softened and sweetened

them and had made them flow like honey beyond their proper margins, here oozing out in a golden stream, washing from its place a florid Gothic capital, drowning the white violets of the marble floor ...¹⁹

The stone becomes, through time's agency, something that flows, like the mountains that over aeons come to nothingness. The pleasure of ruins captures the imagination because our most monumental efforts to make things that stand still for ever are seen to result ultimately in flow; because nature's vitality triumphs over the schemes of mankind; because the vestigial and dilapidated give rise to imaginative sublimity, as a mountain partially lost in mist seems more awe-inspiring than one in plain sight. All of which return us from the world of the left hemisphere to that of the right.

Above all, time is a way of precipitating out into infinitely various actuality the undifferentiated oneness from which the universe began; and it is this that I believe Blake meant by the wonderful line: 'Eternity is in love with the productions of time', which I have already quoted. Time, as Shelley might have said, 'like a dome of many-coloured glass, stains the white radiance of eternity', evoking the colours of the stained glass of Combray's church windows washing across the floor.

Movement is not possible without the existence of both space and time. Whether or not time or space could exist without motion, the least one can say is that they are inconceivable without it. If one tries to imagine what space would be like in a static universe, one cannot help one's point of view moving within it. And time in which there was no movement, and therefore no possibility of change, would have no meaning: it would be automatically 'outside time' (the German word for 'verb' is *Zeitwort*, a 'time-word'). Perhaps this displays only that our experience of time and space is bound up with our consciousness, and that we cannot transcend what our consciousness delivers: but since the very terms 'time' and 'space' are themselves attempts to describe aspects of experience, it is self-defeating to try to apply them to something we could never experience at all. They are both realms of potential in relation to the 'here' and the 'now' of experience, potential that is constantly, as I say, precipitated out into the actual through flow; and have meaning only in relation to the purposes of a conscious being that can *inhabit* them.

If one ceases to inhabit them, to be *present* within them, one has only *re-presentations* from the outside. It is this that is treacherous. In these representations space becomes two-dimensional, and time loses its single, only dimension, and becomes frozen.

THE REPRESENTATIONS OF LINEAR TIME

There is still, however, a place for the linear expression of time: we need to speak of yesterday and tomorrow. Once again, note: over the short term time appears linear, as the round horizon appears straight and the round earth flat – over the short term.

In linear time we normally think of the future as lying in front of us, as that ‘space of time’ into which we move forward, and the past as what we leave behind us. However, in some languages, for example the Peruvian language Aymara, or in Malagasy, the language spoken by the people of Madagascar, the future is in the space behind us – since we can’t see it – and the past is in front of us, because it is visible, at any rate present to our mind’s eye. These differences are expressed in the direction in which Aymara speakers gesture when referring to the future or past compared with Spanish speakers.²⁰

In Chinese, there is both a vertical and horizontal time axis: left before right, as in the West, but also above before below. When asked to arrange pictures of actors in order of age, bilingual Mandarin and English speakers spontaneously arranged pictures of the American actor Brad Pitt in age order from left to right, but pictures of Jet Li, a Chinese film star, top to bottom.²¹ It may be relevant that Chinese, Japanese and Korean script can be (and used only to be) written from top to bottom (and from right to left). When writing vertically, it is commoner for Chinese speakers to use Chinese numerals, and when writing horizontally to use Arabic numerals.²²

One might ask why, when arranging the pictures of Brad Pitt horizontally, Chinese speakers do not arrange them right to left, rather than left to right. There may be two reasons. One is that although vertical writing was right to left, and therefore at one point Chinese horizontal writing was also right to left, the pressure to write horizontally was Western and the direction has since followed Western left-to-right convention. The other is that there may be an inbuilt sense of increasing magnitude as one moves into right hemispace: for instance, even three-day-old chicks already share this representation of numbers, consistently seeking lower numbers to the left of a target and larger numbers to the right.²³ This phenomenon has been put forward as the explanation of an intriguing finding that patients with left

hemineglect (due to a right hemisphere lesion) fail to recall items in a story associated with the past, but remember items associated with the future: the researchers assume that this is because the past is represented in the left half of mental space, and the future in the right.²⁴ (It might have more to do with the possible predilection for the future in the left hemisphere and for the past in the right hemisphere: see below.) This ‘timeline’ representation survives right hemisphere damage, and so must be at least partly left hemisphere-dependent (no-one to date seems to have investigated whether the timeline survives left hemisphere damage).²⁵

In Pormpuraaw, an Australian Aboriginal community, the direction of time relates to the direction of motion of the sun, the East-West axis, not to the direction the speaker happens to be facing at the time.²⁶ Time for the Yupno people of Papua New Guinea flows uphill and is not even linear. The past is always downhill, in the direction of the mouth of the local river, and the future is towards the river’s source, which lies uphill – a rich metaphor indeed.²⁷

Different languages tend to spatialise time differently in other respects, too. For example, English and Swedish speakers talk in a linear fashion about long and short periods, whereas Greek and Spanish speakers use images of volume, referring to big or small periods. This can be shown to have a subtle influence on the way they think about time.²⁸ But the differences are small compared with the overwhelming truth that in our imagination, always and everywhere, space trumps time. Representations of time depend on space more than representations of space depend on time.²⁹ Space is simply more easily conceptualised than time. Children produce spatial terms earlier than temporal ones: for example they use ‘here’ and ‘there’ long before they use ‘now’ and ‘then’.³⁰ In schizophrenia, as we saw, time is spatialised, and one sign of this is that spatial adverbs tend to replace temporal ones: in schizophrenia, then, the hemisphere of representation trumps that of experience.

CAN WE AVOID THE SPATIALISATION OF TIME?

Jaynes thought, as we saw, that avoiding spatialisation of time was impossible. But is it? All our diagrammatic representations, it is true, represent the whole of time at an instant, at ‘the same time’, and as something in which points of time can be located. It is here that we need to turn to a proper understanding of Bergson. He gives us a very important clue which is in astonishing accord with the hemisphere hypothesis.

Bergson saw time as a fundamental reality distinct from space, not a series of ‘instants’, where each instant would correlate with a position occupied by an object moving along a path. Rather, time is, he held, like music, which unfolds seamlessly, and where each ‘note’ that we can identify is only understandable as part of a melody or musical sequence which is appreciated as whole, and where any one note, and those before and after, interpenetrate. They are not like the trucks of a goods train, ‘a continuous line or a chain, the parts of which touch without penetrating one another’, but like the flow of a river, what he calls a ‘succession without distinction ... a mutual penetration, an interconnexion and organization of elements, each one of which represents the whole, and cannot be distinguished or isolated from it except by abstract thought’.³¹

Henri Bergson is someone I will draw on repeatedly in this chapter. Because he has been so neglected, many readers may know little about him, and what they do know about him might be inaccurate, if gathered at second-hand, which nowadays is mainly the case: hence the need for an aside on his significance.

When I first learnt, in my teens, about Bergson’s most famous distinction, that between *temps* and *durée*, it was presented as a distinction between objective time (*temps*), as measured by the clock, which is regular, and subjective time (*durée*), which is widely variable. I felt rather surprised at the fuss about this, since there were surely no Nobel prizes for that one (and he did win a Nobel prize): every child knows that time goes more slowly in the dentist’s waiting room. But that was not what Bergson was drawing our attention to. He was making a far more interesting distinction, one with immense, though not immediately discernible, consequences. Time, once it is measured – clock time – becomes spatialised as a

succession of points: time as experienced is no such thing (though we *think* of it as such). In representing it we destroy its essence: and the consequences are, literally, world-shattering, as we shall see.

The eclipse of Bergson is interesting. He was the most famous philosopher of the first half of the twentieth century, and received a Nobel Prize for his work. In his day, he was better known, more prestigious and more influential than Einstein. His lectures were so well attended that a public lecture he gave in New York in January 1913 is credited with causing Broadway's first traffic jam. His influence on the Pragmatists, James and Dewey in particular, on the process philosophers Whitehead and Hartshorne, and on the phenomenological tradition of Husserl, Heidegger, Merleau-Ponty and Scheler has been far-reaching. His thoughts on the nature of time are profound and of enduring interest. It is almost impossible to say anything useful about time without reference to him. Yet extraordinarily enough the entry on 'Time' in the *Stanford Encyclopedia of Philosophy* by Ned Markosian does not mention him. What happened here?

I believe there are several elements to his eclipse. First, and above all, he was a man ahead of his time, 'developing a theory of consciousness within a framework of physical thought which anticipated a crisis in classical physics yet unforeseen and other discoveries yet to come', principally those of quantum mechanics.³² By the time those discoveries were made by physicists, his philosophical anticipation of them had been all but forgotten, and is only recently being rediscovered. Second, he developed a theory of direct perception and of memory long before such theories began to gain currency, though in recent years a version of his thinking has, belatedly, become a much-discussed – and much-needed – alternative to the idea that perception concerns only mental representations inside the head.³³ Then again, he was bold enough to posit an impulsion in living things which he called *élan vital*: unpopular with the mechanistic tradition in biology, by whom what Bergson intended has rarely been understood, it means nothing like what is often naïvely assumed: I will come to that in due course. And finally there was the inconclusive debate with Einstein in Paris in 1922.

This debate continues to be a live issue among philosophers and physicists, with some maintaining that Bergson misunderstood Einstein, while others maintain that, on the contrary, Einstein misunderstood Bergson. On this question, if no other, it has been said that Einstein

belonged to the school of Parmenides, and Bergson to the school of Heraclitus;³⁴ and we have already seen that that dispute is not resolved among philosophers. The physicist and historian of science Jimena Canales has written a fascinating investigation into what she calls the ‘behind-the-scenes’ correspondence between scientists whereby the view of Einstein came to be promoted at the expense of that of Bergson, despite Bergson’s views being consonant with those of important physicists and mathematicians such as Poincaré, Lorentz, Michelson and de Broglie.³⁵ After describing how much both quantum mechanics and information theory have learnt from Bergson since the last war, she writes that,

across a growing number of disciplines, from psychology to cybernetics, scientists stressed the pertinence of Bergson’s conclusions ... the vindication of Bergson’s work by scientists strengthened in the late 1960s and continued for the rest of the century.

Canales quotes the philosopher Peter Gunter, editor of a collection of essays on Bergson by scientists and philosophers ranging from the physicist Louis de Broglie to the philosopher Milič Čapek: ‘The charge of anti-scientific intention with which Bergson has been saddled is seen to be not merely misleading but radically false: Bergson’s philosophy of intuition is the affirmation, not the negation of science.’³⁶

In the tradition of ‘both/and’, it is perfectly possible for both Einstein and Bergson to be right. Bergson did not dispute Einstein’s findings. Bergson was simply working at a different level, a subsequent level – that of what you take the findings to *mean*, which is always a matter of interpretation. He saw that Einstein’s theory related to clocks, and measurement; but that what is measured is not the whole of time, because time is inextricably bound up with consciousness, and indeed at the core of what it is to be a human being. Einstein’s relative time frames were in one sense absolute, in that they were consciousness-independent. His findings and theory were not *wrong* – just radically incomplete: they could not exhaust the true meaning and importance of time. Scientists sometimes imagine that their formulations *are* the reality which the formulations merely represent, whereas they can only ever be practical tools that help us

manipulate one *aspect* of reality for a while. They are not wrong for being partial, like all truth. But the mistake is to take them for the absolute truth.³⁷

However, that may not be the end of the story. Essentially, in the terminology of modern physics, Einstein believed in a ‘block universe’, a universe in which all times co-exist simultaneously. Einstein’s theories could not be reconciled to quantum mechanics, a fact which vexed Einstein till his death; but Bergson’s theory (like recent quantum field theory) could, and in the end, quantum field theory is the best description of physical reality we have. Einstein’s ‘relativity physics’, according to Louis de Broglie, supporting Bergson,

pushed the spatialisation of time and the geometrization of space to their extreme limits, because it is from this point of view the final development of classical physics ... in spite of the undeniable and admirable light which it brings to bear for us on many questions, relativity theory has not succeeded in interpreting phenomena in which quanta intervene; and in order to do so it was necessary to develop theories stranger than that of relativity. Today, it is certain that quantum theories penetrate into more profound strata of reality than all previous theories. The theory of relativity itself now appears to us as simply a macroscopic and statistical view of phenomena: it describes things approximately and in bulk and does not descend profoundly enough into the detailed description of elementary processes to allow us to perceive quantum discontinuities there. It is quantum physics, whose most advanced form is wave mechanics, which has enabled us to penetrate into the mysteries of elementary processes ...’³⁸

According to de Broglie, Bergson’s *Time and Free Will* (his doctoral thesis of 1889), ‘antedates by forty years the ideas of Niels Bohr and Werner Heisenberg on the physical interpretation of wave mechanics’.³⁹ ‘Space contains only parts of space, and at whatever point of space we consider the moving body, we shall get only a *position*’, wrote Bergson.⁴⁰ In quantum mechanics, as de Broglie points out, a particle represents a point precisely located in geometric space with no motion, and a wave represents motion in a pure state with no spatial location.⁴¹ As our

uncertainty of a particle's position decreases and approaches a point in space, our uncertainty of its momentum necessarily increases, and vice versa. The measurement tends to project the particle to a point in space or on a geometric continuum, but to the very extent that the process succeeds, motion is excluded.⁴² This is often seen as just one of a number of bizarre elements of quantum mechanics, but it could be seen as bound up with the very nature of time.

And this cannot be wholly separated from consciousness, and therefore from the brain. Bergson made a distinction between two forces in consciousness, each delivering a different and mutually incompatible take on reality, but between them constituting a normal person's mental world. Bergson called them *intellect* (sometimes *intelligence* – though it is not at all the same as intelligence as we now understand it) and *intuition* (sometimes *instinct* – though what Bergson called 'intuition' is more capable of disinterestedness and self-awareness than his 'instinct'). The terminology is potentially misleading, because 'intuition' has its intelligence, and 'intelligence' has its unconscious assumptions, but that is not important, as I will suggest. Just follow me for a few paragraphs.

What Bergson calls *intellect* sees things as separate from one another in space, and frozen in time – what he called the cinematographic representation of the world, a rapid succession of still frames. By contrast, *intuition* experiences directly the undivided flow of experience in time, in which no one thing can ultimately be separated from any other; intuition, according to Bergson, is even 'life itself'. Precisely because it is not a representation, but the very presence of life itself, it cannot be *represented* in words without distorting its essence: only poetry, and ultimately music, could in any way succeed here.

The reason that an exact explication of Bergson's terminology is not important to readers of this book is that the deep distinction that is being made is quite astonishingly close to one with which they are already familiar. According to Kolakowski, perhaps his greatest expositor, Bergson

argued ... that our analytic mind ... is not interested in reality as it truly is, only in its potential utility ... Our [analytic] intelligence is constructed in such a way as to be able to deal adequately with inert matter and to organise it according to the needs of life; it is primarily an organ of survival and of progress in technical skills. Its

tendency is to reduce qualities to quantitative differences, new phenomena to old patterns, the unique to the repeatable and abstract, time to space.⁴³

Here he makes (of course, unknowingly) at least four important hemisphere distinctions in one sentence. And Kolakowski continues:

All the expressions of consciousness, our sensations, emotions, and ideas, ‘display a double aspect: one is clear, precise, and impersonal; the other is confused, infinitely mobile, and inexpressible, because language cannot grasp it without immobilising its mobility’.⁴⁴ This inability of language to describe the “profound self”, far from being a contingent defect, reveals the very nature of our linguistic apparatus: language, as part of our intelligence, is essentially a set of abstract signs; its task is to classify objects, to dissolve them into conceptual classes; uniqueness, unless it is an empirically unique collection of abstracts, is beyond its reach.⁴⁵

Bergson’s philosophical pronouncements amount to a clear description of each hemisphere, so we can now substitute the more scientifically correct and less confusing labels. Bergson also thought that, while ‘intuition’ (RH) was modelled along the same lines as life itself, ‘intellect’ (LH) was intrinsically incapable of understanding intuition, and indeed incapable of understanding life.⁴⁶ Subsequent neuropsychological research bears this out, as, once again, we have already seen, and will further see.

Bergson thought that our intellect (LH) permitted useful ‘things’ to be isolable in, and to stand forth from, the whole in which they inhere, because of what they unconsciously offer to the left hemisphere as opportunities to utilise them – and for that reason come into focus for it as ‘things’.⁴⁷ In keeping with this, a ‘particle’ could be seen as the result of the intellect’s attempt – the attempt of the left hemisphere – to grasp what the right hemisphere sees as a ‘wave’.

Bergson refers to (what we now know to be) the takeover of the right hemisphere’s insights by the left hemisphere’s representation. He calls this process ‘converting intuition into symbols’, thereby emphasising that the

outcome of ‘intellectualized time is space’, and therefore, ‘the intelligence [LH] works upon the *phantom* of duration, not on duration itself’.⁴⁸

What Smolin says of time a century later corroborates Bergson precisely:

If we confuse spacetime with reality, we’re committing a fallacy, which can be called the fallacy of the spatialisation of time. It is a consequence of forgetting the distinction between recording motion in time and time itself. Once you commit this fallacy you’re free to fantasise about the universe being timeless and even being nothing but mathematics. But, the pragmatist says, timelessness and mathematics are properties of representations of records of motion – and only that. They are not and cannot be properties of real motions. Indeed it’s absurd to call motion ‘timeless’ because motion is *nothing but* an expression of time.⁴⁹

TIME AS FLOWING PROCESS ONLY

‘How can we help seeing’, writes Bergson,

that the essence of duration is to flow, and that the fixed placed side by side with the fixed will never constitute anything which has duration. It is not the ‘states’, simple snapshots we have taken once again along the course of change, that are real; on the contrary, it is flux, the continuity of transition, it is change itself that is real. This change is indivisible, it is even substantial [*il est même substantiel*].⁵⁰

Hang onto that word ‘substantial’. The word is carefully chosen.

Zeno’s method involves destroying the fundamental nature of time and space by *atomising* them; and what Zeno shows most beautifully in the process is that atomism – the belief that we can analyse reality into distinct, separable, chunks without loss – does not apply to the real world. It applies only to the left hemisphere’s representation of the real world: its diagram or map. In reality neither space nor time is atomistic. In fact, nothing is atomistic – not even atoms (as we shall see in Chapter 24.) And that is something that the intuitive understanding of time from within experience, available to the right hemisphere, enables us to see.

What Zeno discovered was that, if you stop time’s flow, and find *states* (by definition, ‘static’), you make nonsense out of it. Because it doesn’t just *have* flow, but *is* flow: stopping it therefore destroys its very nature. There is no flow without time, and there is no time without flow. As you will remember, Schopenhauer asked: ‘What is *time*? What is this being that consists in nothing but movement, *without anything that moves*?’⁵¹ Bergson had the same insight. For Bergson, there is always a priority of movement over the things that move; the things that move are an abstraction from the movement:⁵²

There are changes, but there are underneath the change *no things which change*: change has no need of a support. There are

movements, but there is no inert or invariable object which moves:
*movement does not imply a mobile.*⁵³

The sense that there must be things underlying the flow comes about because we imagine a change as being really composed of states, which are, however, only retrospective, left hemisphere representations. In the famous phrase of Yeats's I quoted in the Introduction, we cannot 'know the dancer from the dance'.

You cannot understand Bergson without 'getting' this insight; if you don't, he will seem to make little sense. Once one does, however, it becomes clear: simply the result of taking a long cool look at the nature of reality before the left hemisphere has taken that reality up and re-presented it as 'things set in motion'.

I shall want to look more fully into the concept of flow and its relationship with the nature of reality in the next chapter. But here, in discussing time, we cannot penetrate into Bergson's understanding of time without anticipating some of that discussion. So here goes.

Bergson asks that, instead of thinking that what we experience is a surface state covering something *else* that is real, 'maintaining with it a mysterious relationship of phenomenon to substance', we should see the *experience itself* as real: for intuition (the RH)

will seize upon one identical change which keeps ever lengthening as in a melody where everything is becoming but where the becoming, being itself substantial, has no need of support. No more inert states, no more dead things; nothing but the mobility of which the stability of life is made.⁵⁴

And he adds that 'a vision of this kind, where reality appears as continuous and indivisible', is the basis of an intuitively responsive and responsible philosophical understanding of reality. It is, in my view, the key.

Note this does not deny that there are elements in the flow that stand forth to us *as though* wholly separate: but insists that they are better seen as merely *distinct* (that is to say discernibly different, though ultimately not entirely divorced from one another or from the flow which they *are*). This

insight is in line with traditions in East and West going back some thousands of years, but more recently lost from view.

It also reverses our customary post-Cartesian ontology – which is why it may be difficult, or even impossible, for some to see it at first. In our philosophy things are primary: how they come to be set in motion, and how they come to give rise to what we perceive, are then natural, but secondary, questions. Things are, as we say, *substantial*: that means literally that they ‘stand under’ (Latin, *sub-*, under, + *stare*, to stand) and provide necessary support, like a stage, on which the phenomena that we see and experience are ‘played out’. Bergson’s realisation was that this was back to front – or rather, upside down. Reality is what we experience – ever moving, changing, and continuous. Things, however, are secondary, static, products of perception which supervene on ‘from above’, not support ‘from beneath’, that field of flow.

What we perceive, he says, when we see something – and he was highly cognisant of developments in the physics of his day – is ‘a series of extremely rapid vibrations. This alleged movement of a thing is in reality only a movement of movements.’ And he continues:

the truth is that there is neither a rigid, immovable substratum nor distinct states passing over it like actors on a stage. There is simply the continuous melody of our inner life, – a melody which is going on and will go on, indivisible, from the beginning to the end of our conscious existence. Our personality is precisely that. This indivisible continuity of change is precisely what constitutes true duration ...⁵⁵

As with the continuity of personhood, we must avoid the dissolution of something that is seamless and in which all the ‘parts’ interpenetrate, into slices, or pieces, of something formerly alive. Once again the vital image is that of music, specifically melody (which, as you remember, is also appreciated largely or only by the right hemisphere):

When we listen to a melody we have the purest impression of succession we could possibly have, – an impression as far removed as possible from that of simultaneity, – and yet it is the very

continuity of the melody and the impossibility of breaking it up which make that impression upon us. If we cut it up into distinct notes, into so many ‘before’s and ‘after’s’, we are bringing spatial images into it and impregnating the succession with simultaneity: in space, and only in space, is there a clear-cut distinction of parts external to one another. I recognize moreover that it is in spatialized time that we ordinarily place ourselves ...⁵⁶

Being absorbed in a piece of music, as opposed to standing back and analysing it, we perceive change itself, not *things* that change:

This change is enough, it is the thing itself. And even if it takes time, it is still indivisible; if the melody stopped sooner it would no longer be the same sonorous whole, it would be another, equally indivisible. We have, no doubt, a tendency to divide it and to picture, instead of the uninterrupted continuity of melody, a juxtaposition of distinct notes. But why?

One reason might be that we are thinking of the efforts of the musical performer as discrete actions – moving an elbow, drawing breath – each player separately – and then added together, not as an embodied whole; and because we are tyrannised by the eye, seeing the music as if we were looking at notes placed next to one another upon an imaginary score, *reading* it: ‘If we do not dwell on these spatial images, pure change remains, sufficient unto itself, in no way divided, in no way attached to a “thing” which changes’.⁵⁷ This accords, profoundly, with my experience.

In trying to help us shift our perception, Bergson repeatedly gives an accurate description of a number of differences between the right hemisphere’s understanding and that of the left, though of course having no knowledge of hemisphere difference. Describing the narrowing of the attentional field that inevitably accompanies left hemisphere apprehension, he writes, extraordinarily enough, that ‘the necessities of action tend to limit the field of vision ... distinct perception is merely cut, for the purposes of practical existence, out of a wider canvas’; and he goes on:

Our knowledge, far from being made up of a gradual association of simple elements, is the effect of a sudden dissociation: from the immensely vast field of our virtual knowledge, we have selected, in order to make it into actual knowledge, everything which concerns our action upon things; we have neglected the rest.

The matters that concern us become ‘things’ in the focus of our attention. We can *use* them. The rest of the picture, its background and context, the left hemisphere neglects. And then, with uncanny accuracy – remember this is 1911 – he continues:

The brain seems to have been constructed with a view to this work of selection. One could say as much for perception. The auxiliary of action, it isolates that part of reality as a whole that interests us; it shows us less the things themselves than *the use we can make of them*. It classifies, it labels them beforehand; we scarcely look at the object, it is enough for us to know to which category it belongs. But now and then, by a lucky accident, men arise [great artists] whose senses or whose consciousness are less adherent to life. Nature has forgotten to attach their faculty of perceiving to their faculty of acting ... It is therefore a much more direct vision of reality that we find in the different arts; and it is *because* the artist is less intent on *utilizing* his perception that he perceives a greater number of things.⁵⁸

Focussing on what you currently think to be useful means that you inevitably see much less. ‘Educationalists’ and economists, take note.

Bergson sees the key move that philosophers – and all thinking people – need to make as ‘turning this attention aside from the part of the universe which interests us from a practical viewpoint and turning it back toward what serves no practical purpose’. But, of course, by this he doesn’t mean abandoning a sense of purpose. He means not being caught up in the *utilitarian* purposes of the left hemisphere; instead aiming to attend in a way that is not already committed or attached (‘stuck’ in the case of the left hemisphere) to a particular focus selected for its usefulness. ‘This conversion of the attention’, he says, ‘would be philosophy itself.’⁵⁹ The

mistake that is made by many traditional philosophers, he suggests, is to believe that freeing one's attention up in this way necessitates turning one's back on practical life, rather than, in fact, embracing it.⁶⁰ 'One should act like a man of thought', he wrote, in a memorable formulation, 'and think like a man of action'.⁶¹

Here I am aware of a number of strands that link the philosophical shift that Bergson exhorts on us with Eastern modes of cognition and perception. The emphasis on detachment from our usual busy concerns, yet without turning one's back on practical life; the ability to see the background as well as the foreground; to see ourselves within a bigger picture; to embrace what may seem initially paradoxical; above all, to sense flow and movement as the ground of existence; and to see that the whole is experienced as prior to its differentiation into the parts that we later identify as arising from it: it is not constructed from those parts.

One of the paradoxes is that change and permanence are not opposites (here we come back to the tree of Hegel – or the river of Heraclitus – each of which *persists* only by seamless *change*). Speaking of those who fail to see it, Bergson writes:

Change, if they consent to look directly at it without an interposed veil, will very quickly appear to them to be the most substantial and durable thing possible. Its solidity is infinitely superior to that of a fixity which is only an ephemeral arrangement between mobilities ... if change is real and even constitutive of reality, we must envisage the past quite differently from what we have been accustomed to doing through philosophy and language.⁶²

If we succeed in doing so, the rewards are plentiful:

what was immobile and frozen in our perception is warmed and set in motion. Everything comes to life around us, everything is revived in us ... grave philosophical enigmas can be resolved or even perhaps ... need not be raised, since they arise from a frozen vision of the real and are only the translation, in terms of thought, of a certain artificial weakening of our vitality ... ⁶³

The process of coming back to life, through engagement of what he calls 'intuition', is the exact inverse of the process of devitalisation which occurs in right hemisphere deficits, and in schizophrenia as we saw in Chapter 9. And his insight that often 'grave philosophical enigmas ... arise from a frozen vision of the real' is borne out by the discussion of paradox in Chapter 16.

With that necessary brief excursion into the nature of flow as it relates to time, I will now return to the topic of time itself.

TWO KINDS OF TIME – OR JUST ONE?

I have repeatedly referred to the importance of depth – in time, in space and in feeling; and to how they, like the sense of animacy, are delivered largely by the right hemisphere. Seeing things in relation to their past and future yields depth and brings them to life.

Let us grasp afresh the external world as it really is, not superficially, in the present, but in *depth*, with the immediate past crowding upon it and imprinting upon it its impetus; let us in a word become accustomed to see all things *sub specie durationis*: immediately in our galvanized perception what is taut becomes relaxed, what is dormant awakens, what is dead comes to life again.⁶⁴

How we understand time influences what sense we make of the world: whether we cleave to the last couple of thousand years of Western history, and its devitalising force, or see beyond what that model (fruitful in its way and for a time) taught us. Our understanding of time ramifies into everything that matters: especially into our understanding of life itself.

Merleau-Ponty saw the vital connexion between time and the conscious subject:

There can be time only if it is *not completely deployed*, only provided that past, present and future do not all three have their being in the same sense. It is of the essence of time to be *in the process of self-production*, and not *to be*; never, that is, to be completely constituted. Constituted time, the series of possible relations in terms of before and after, is not time itself, but the ultimate *recording* of time, the result of its *passage*, which objective thinking always presupposes yet never manages to fasten on to.⁶⁵

What Merleau-Ponty calls ‘constituted time’ here is McTaggart’s B-series time, in which you see the lot at once. But as Merleau-Ponty hints, in

what sense can that be said to be time at all? It is a 'recording', the result of its having all – past, present and future – already passed. It is time retrospected on and frozen: a re-presentation of a something, the nature of which 'something' is, in itself, quite different in kind from any possible representation; something whose very nature is already lost in the representation. Merleau-Ponty continues, speaking of this 'constituted' time:

It is spatial, since its moments co-exist spread out before thought; it is a present, because consciousness is contemporary with all times. It is a setting distinct from me and unchanging, in which nothing either elapses or happens.

And so he goes on:

There must be *another true time, in which I learn the nature of flux and transience itself* ... time in short needs a synthesis. But it is equally true that this synthesis must *always be undertaken afresh*, and that any supposition that it can be anywhere *brought to completion* involves the negation of time.

Why a synthesis, and why must it always be begun afresh? Because if you treat the representation of time as itself a kind of time (even if 'constituted'), you are left with a conundrum. Time as conceived by the left hemisphere is a *thing*, that just *is*, once and for all, and can be broken down by analysis. For the right hemisphere, on the other hand, there is only change, forever coming into being and swirling away. Time, for the right hemisphere, is not something distinct from being, from reality flowing: it is always thus a *becoming*, never a something become.

And all this that we have heard from Bergson, from McTaggart, from Heidegger, from Merleau-Ponty was anticipated by the never-failing insight of Goethe, 200 years ago, that

Vernunft is concerned with what *is becoming*, *Verstand* with what *has already become* ... The former rejoices in whatever evolves; the latter wants to hold everything still, so that it can utilise it.⁶⁶

To remind you, *Vernunft* is ‘reason’ as the right hemisphere understands it; *Verstand* is ‘rationality’ as the left hemisphere understands it. Atomic moments only occur in retrospection and re-presentation: in the words of Sandra Rosenthal, ‘movement from one interval to another is not a movement over discrete units but a spreading out of a continuous process of becoming other.’⁶⁷

The left hemisphere’s preoccupation with utility, as Goethe saw, leads it to seek the abolition of motion. ‘Our action exerts itself conveniently only on fixed points’, wrote Bergson:

fixity is therefore what our intelligence seeks; it asks itself where the mobile is to be found, where it will be, where it will *pass* ... But it is always with immobilities, real or possible, that it seeks to deal ... Immobility being the prerequisite for our action, we set it up as a reality, we make of it an absolute, and we see in movement something which is superimposed.⁶⁸

In other words, to the left hemisphere things appear simply static, and what has to be explained is how motion comes about on this static scene; whereas to the right hemisphere, everything flows, as it is immediately experienced, and what needs to be explained is how stability can arise from this flow. As the reader will remember, this issue was first raised in Chapter 12, where I contrasted the mechanical with the organic view of a living being.

WHEN TIME BREAKS DOWN: CARTESIANISM

If in reality ‘everything flows’, what could be more devastating than the loss of flow from one’s world? Nothing, not even one’s self-experience, would appear real any more.

The static and the timeless has been privileged in the West ever since Plato followed the path of Parmenides, not Heraclitus. With Descartes things went much further. Descartes deliberately excluded from his thought processes, like many subsequent philosophers in the analytic tradition, the kind of understanding available from the right hemisphere; and so he was obliged to see time as composed of static points or slices in need of a mysterious *stitching together*. According to the philosopher Charles Sheroover, Descartes had ‘problems with the very idea of temporal continuity, epitomized in his conviction that each moment is a somehow irreducible real self-enclosed atomic point in the structure of the universe, and is devoid of any sustaining continuity with any other moment’.⁶⁹ I quoted Descartes’ words to the effect in Chapter 16; and his conclusion that ‘the thing which endures may cease to be at any given moment.’⁷⁰

Notice how precarious existence immediately comes to appear. Abstraction, as William James saw, generates ‘a world which dies and is born anew at every instant’, like the world which Descartes imagined.⁷¹ I do not need to remind you that Descartes also believed that animals were merely automata,⁷² and that human beings were only *assumed* not to be automata: ‘if I look out of the window’, he wrote, ‘and see men crossing the square ... do I see any more than hats and coats which could conceal automatons? I *judge* that they are men ’.⁷³ His view of time is of a piece with the rest of his philosophy, and with the left hemisphere’s world view. One of fragmentation, devitalisation and mechanism.

Descartes’ philosophy famously helped to perpetuate a sundering of the natural union of mind and body, and his understanding of the ego was unaccommodating to the idea of intersubjectivity. In fact, when one puts it all together, he experienced, through an effort of the analytic intellect, the same difficulties that are normally reserved to people with schizophrenia in the perception of time.

There is a clear connexion between the juddering sequence of static moments that replace flow and the alienation of the self, as well as the loss of a coherent narrative that might give it permanence. One patient reports:

You are dying from moment to moment and living from moment to moment, and you're *different each time*.⁷⁴

Once again we are reminded of Capgras syndrome: there is no continuity over time. In schizophrenia subjects do not, of course, lose the capacity to see difference. So, if no process of change is any longer experienced, difference can only mean a constant process of substitution of one isolated, static percept for the next. 'People's faces [are] changing', reports one patient: 'things on the ward aren't organized – they change all the time'; and another complains that the 'organisation of things' is 'different ... there was no-one I could recognize', they seemed 'changed'.⁷⁵ A change in appearance means a new 'thing' has been substituted: as a result everything becomes alien, unrecognisable.

WHEN TIME BREAKS DOWN: SCHIZOPHRENIA

In their fascinating, detailed explorations of patients who had unusual experiences of their own body – whether they were brain-damaged or those with so-called ‘functional’ illnesses, such as schizophrenia – neuropsychiatrists Henri Hécaen and Julian de Ajuriaguerra remark on those who had a problem with time that its effects are pervasive, and that it attacks one’s whole sense of embodied being:

The experience of lived time, the change that comes over personal time, appears to be at the core of the syndrome [of schizophrenia] ... No longer able to avail themselves of the integrating power of time, patients arrive at a condition (to use Minkowski’s expression) of ‘morbid dualism’, in consequence of which things break down, even the *feeling of existing at all* ... Through loss of lived synchrony, which is to say loss of the dynamic element in vital phenomena and its replacement by the static, the ‘*mind-body synthesis*’ *breaks down* ... the synthesis of one’s personhood disintegrates *as the static replaces the dynamic* ...

We have repeatedly found a disruption of the idea of time in subjects presenting with alterations of body awareness. Sometimes it is the feeling of continuity, of lived time, of the duration of time that is disturbed in these patients, and the synthesis of what it is to be ‘myself’ – which in the normal individual cannot be separated out into parts – seems to come undone ... The violation of the normal temporal assumptions wrenches our mental life out of the realm of what is automatic, and this disruption compels us to see our body more or less as a form that is distinct from our personhood ...⁷⁶

The loss of the sense of time has been repeatedly singled out as the essential deficit, to be traced in all aspects of the psychopathology of schizophrenia. Pointing to its centrality, the contemporary phenomenologist Giovanni Stanghellini writes that

temporality ... constitutes the bedrock of any experience ... The disintegration of time consciousness has obviously serious psychopathological consequences for the way one experiences the phenomenal world and relates to oneself.⁷⁷

The psychiatrist Franz Fischer observed that every symptom of psychosis in schizophrenia can be related to the disturbance of time.⁷⁸ Hécaen and de Ajuriaguerra remarked in the 1950s that, in schizophrenia, 'the alteration in subjective time, the experience of lived time, seems at the core'.⁷⁹ Around the same time, the psychiatrist and philosopher Ludwig Binswanger described the way in which 'time virtually comes to a standstill' as the 'most characteristic feature' of the schizophrenic world.⁸⁰ And in his magisterial works from the 1920s and '30s, *La schizophrénie* and *Le temps vécu* (translated as *Lived Time*), Eugène Minkowski performed the richest and most profound examination of disrupted time, as the core phenomenological transformation in schizophrenia, ever conducted. It is astoundingly suggestive.

Fischer made a further observation, that the temporal thought of schizophrenics may become more saturated with internal space as the disease progresses.⁸¹ Repeatedly, clinicians and psychopathologists have referred to a spatialisation of time in schizophrenia. What they mean by this is the substitution of the way we represent time – a succession of serial instants on a time line – for the way we experience it when we are living, and present within its flow; thereby killing it.

Making space temporal is an act of vivification; making time spatial an act of vivisection. Being depends on time, *Sein* on *Zeit*. With the loss of time the world becomes mechanical, and lifeless; ultimately it fragments and becomes incoherent. Mind (our thinking faculty) and body (our inhabited, intuitive experience) come apart. All this we saw clearly exemplified in the descriptions by patients in Chapter 9. Heidegger could not have known how clearly the connexion between time and being is demonstrated by the testimony of those who live with the devastating consequences of alienation from time.

Indeed time's being alien – 'an *alien time* seemed to dawn'⁸² – is sometimes all a patient can say of it: its altered quality simply cannot be put into words.⁸³ Another patient says, 'new time is being produced' and

another that '*new time* was infinitely manifold and intricate and could hardly be compared with what we would ordinarily call time.'⁸⁴

When it is possible to articulate the change in time in schizophrenia, it is that time ceases to flow, either in the sense that it has lost its fluent quality, or that it actually stands still. 'Time's standstill is never-ending, I live in a motionless eternity', says one patient. 'I see the clocks go round, but for me time does not pass.'⁸⁵ And another patient reports that 'time had failed and stood still ... thinking stood still; everything stood still *as if there were no more time*.'⁸⁶ This is a recognised symptom known as *Zeitstillstand*, here most vividly described – note that the consequence is that all meaningful existence is wiped out, with really nothing left:

Time has come to a complete standstill for me, it seems ... I look at the clock – and if I look at it again, it's like an enormous stretch of time has passed, as if hours have gone by; but on the contrary it's been only a few minutes. It feels to me like an enormous period of time is passing. Yet time does not pass at all. I look at the clock but its hands are always stopped at the same position, they never move at all; they never go forward; I listen, to see if the clock has come to a halt, and I hear it ticking, but the hands are always in the same place. I don't think about my past ... Nothing would come to mind, *nothing* ... I could not make myself think about anything. I couldn't envisage anything at all in the future. The present does not exist for me when I am ill like this ... the past does not exist, the future does not exist.⁸⁷

There is a failure of attunement of the psyche with life. I use the word 'attunement', since it avoids the suggestion that we are primarily dealing with a matter of understanding, or even of awareness; it is, rather, the inability to let oneself be entrained in time's flow – to move with the 'music of time'. Life becomes a thing to be observed, not an experience to be inhabited. 'Life is now a running conveyor-belt with nothing on it', says one patient:

It runs on but is still the same ... I am now living in eternity ... outside everything carries on ... leaves move, others go through the

ward but for me time does not pass ... *I wish I could run too, so that time might again be on the move* but then I stay stuck ... time stands still ... It is a boring, endless time. It would be fine to start again from the beginning and *find myself swinging along with the proper time*, but I can't ... *I get pulled back* ... Time is in collapse.⁸⁸

This time is not just alien, but alienating – and boring. Note how the subject feels left out of the momentum of life. Time is the coherence-giving context in which we live. Not to have this is to disrupt many important facets of being, including the sense of belonging, of connectedness, and of meaning to life. Life becomes lifeless – *boring*: a very modern concept (the word arose only in the eighteenth century, and is associated with a disengagement from the world which began with the Enlightenment).⁸⁹ And this lies at the heart of many problems experienced by subjects with schizophrenia – as well as homo sapiens in the twenty-first century – including a sense of the world as being remote or alien; a loss of emotional engagement with the world and others; and experiencing a sense of oneself, others and the world as disembodied mechanisms composed of parts, as we have seen.

As a result of the loss of the flow of time, writes psychiatrist Thomas Fuchs, there is

a characteristic imbalance between lived time (or Bergson's *durée*) and static space. There is a weakening of the dynamic, flexible aspects of life and a corresponding *hypertrophy of the fixed, rational and geometrical* elements.⁹⁰

From absence of time follows absence of motion: the flow congeals. The remarks of many patients refer to this explicitly: everything tends toward the condition of the snapshot, as we saw in Chapter 9. The fixed is graspable, whereas the flow of life never is:

I look for immobility. I tend toward repose and immobilization. I also have in me a tendency to immobilize life around me. Because of this, I love immutable objects, things which are always there and which never change. Stone is immobile. The earth, on the contrary,

moves; it doesn't inspire any confidence in me. I attach importance only to solidity. A train passes by an embankment; the train does not exist for me; I wish only to construct the embankment. The past is the precipice. The future is the mountain.⁹¹

Spatialisation of time. The same patient also said: 'I like immovable objects, boxes and bolts, things that are always there, which never change.'⁹² Another schizophrenic patient, when asked, after a home visit, if she had been happy to see her mother, replied: 'There's movement: I don't much like that'.⁹³

Superficially there are similarities between the experience of time in schizophrenia and depression. In reality, I believe they are different phenomena. I cannot pass over the issue, but I am wary of too great a digression in the argument, so I have relegated my reflections on their differences to Appendix 4.

I demonstrated earlier the extent to which our sense of time depends heavily on the right hemisphere. It is therefore not surprising that there are externally verifiable, measurable alterations in time perception in schizophrenia. A study aiming to uncover the neural correlates of time distortion in schizophrenia found that in patients there was 'significantly lower activation of most right hemisphere regions' involved in time perception in normal subjects.⁹⁴

As a result, though perceptual experiences are embedded in a continuous flow, schizophrenic subjects appear to prefer to process isolated stimuli.⁹⁵ They tend to perceive asynchronous stimuli as simultaneous (unless separated by longer than usual intervals),⁹⁶ and have difficulty discriminating temporal order.⁹⁷ They lose the ability to predict and follow the 'events flow', as if they were unable to experience the unfolding of a melody (which they often are).⁹⁸ Additionally schizophrenic subjects, again just like right hemisphere-impaired individuals, are impaired at judging time duration.⁹⁹

With this vivid insight into the breakdown of time before us, let us return to an examination of its nature.

Even though it is from motion that we gain our sense of both space and time, the ultimate aim of the left hemisphere's focus has to be stasis. Yet everything comes into being only because of motion. 'There is', writes

Bergson, speaking of what we now can see is the process of the left hemisphere,

beneath these sharply cut crystals and this frozen surface, a continuous flux which is not comparable to any flux I have ever seen. There is a succession of states, each of which announces that which follows and contains that which precedes it. They can, properly speaking, only be said to form multiple states when I have *already passed them and turn back to observe their track*. Whilst I was experiencing them they were so solidly organized, so profoundly animated with a common life, that I could not have said where any one of them finished or where another commenced. In reality no one of them begins or ends, but all extend into each other.¹⁰⁰

‘Multiple states’ exist only in retrospective representation: we saw this in considering logical paradoxes (Chapter 16). The world described by Bergson is one that is forever evolving, constantly creative, moving *forward* into newness: one of his greatest works is called *L’Évolution créatrice* (*Creative Evolution*).

This point seems simple enough but its implications are profound. William James shared the insight. Although, once it has come into being, anything can be taken apart, this process sheds

no ray of light on the processes by which experiences *get made* ... to understand life by concepts is to arrest its movement, cutting it up into bits as if with scissors, and immobilizing these in our logical herbarium where, comparing them as dried specimens, we can ascertain which of them statically includes or excludes which other. This treatment supposes life to have already accomplished itself, for the concepts being so many views taken *after the fact*, are *retrospective* and *post mortem*.¹⁰¹

The point James makes is that if we were capable only of reconstituting reality from what has already happened we would be trapped in a lifeless realm where imagination cannot penetrate. The left hemisphere always

dealing with familiar re-presentations, there could only ever be assembled permutations of what is known. ‘When you have broken the reality into concepts you never can reconstruct it in its wholeness. Out of no amount of discreteness can you manufacture the concrete.’¹⁰²

This has implications for determinism. Is the future just the unfolding of what was there all along in the past? Physical determinism is based on a belief in a mechanical universe. In Laplace’s left hemisphere fantasy there was no room for free will.¹⁰³ But physics itself has done away with Laplace’s universe. ‘A most disturbing – or perhaps liberating – consequence of quantum physics is that the past no longer determines the future, at least not completely’, writes physicist Richard Muller:

limited ability to predict the future will remain a fundamental weakness of physics forever ... Despite arguments from classical philosophers, we now know that free will is compatible with physics; those who argue otherwise are making a case based on the religion of physicalism.¹⁰⁴

And he illustrates this from work he has repeatedly replicated as a particle physicist:

we now know that two objects, objects that are completely identical, identical in every way, can behave differently. Two identical radioactive atoms decay at different times. Their future is not determined by their past or by their condition, their quantum physics wave function. Identical conditions do not lead to identical futures.¹⁰⁵

While this may look like a ‘weakness’ from one point of view, it is vital to the free nature of the creative process. To quote another physicist, David Oliver:

There exist physical events the randomness of which cannot be dispelled by the most determined efforts to expose ‘a deterministic cause’ ... a stream of unpredictable information constantly enters

the stream of definite information, a source of novelty, creativity, vitality.^{[106](#)}

Creativity is predicated on uncertainty. Strive for certainty and you kill creativity. As Smolin says:

On a personal level, to think in time is to accept the uncertainty of life as the necessary price of being alive. To rebel against the precariousness of life, to reject uncertainty, to adopt a zero tolerance to risk, to imagine that life can be organised to completely eliminate danger, is to think outside time. To be human is to live suspended between danger and opportunity.^{[107](#)}

TWO KINDS OF POTENTIAL

In a crucial insight, Bergson distinguishes between two ideas of potential. In one, whatever it is that comes into existence is the actualisation of a pre-existing potential entity: there always was, among the possibilities of existence, a *Götterdämmerung*, and Wagner actualised it by writing it, as if he went to the cupboard where potentials are stored, dusted it off and set it upright in the living room of reality. In the other, there is no ghostly version hovering around waiting to be dusted off: Wagner wasn't selecting amongst the possible, which already in some sense pre-existed, but was truly *creating*.

To illuminate the distinction Bergson points to an asymmetry between possibility and impossibility. If I lock a gate, I know no-one can pass. If I open it again, I know someone is likely to pass, but not who it will be, or when. Thus, says Bergson, it is true that some things could come into existence, and some things could not. In that sense there is a field of the possible, and a field of the impossible, but they are not similarly structured. '*Hamlet* was doubtless possible before being realised', he writes,

if that means that there was no insurmountable obstacle to its realisation. In this particular sense one calls possible what is not impossible; and it stands to reason that this non-impossibility of a thing is the condition of its realisation. But the possible thus understood is in no degree virtual, something ideally pre-existent ... from the quite negative sense of the term 'impossible' you pass surreptitiously, unconsciously to the positive sense. Possibility signified 'absence of hindrance' a few minutes ago: now you make of it a 'pre-existence under the form of an idea', which is quite another thing. In the first meaning of the word it was a truism to say that the possibility of a thing precedes its reality: by that you meant simply that obstacles, having been surmounted, were surmountable. But in the second meaning it is an absurdity, for it is clear that a mind in which the *Hamlet* of Shakespeare had taken shape in the form of [the] possible would by that fact have created its reality: it would thus have been, by definition, Shakespeare himself. ¹⁰⁸

It may be objected that a mind is unnecessarily posited, but is that not what *must* be posited in the case of something such as *Hamlet*? And of time? *Hamlet* without the mind of an author could not be *Hamlet*, even in potential: it would just be Bergson's lack of impossibility, in the sense that an eternally running computer (quite a supposition in itself) would crank it out eventually, because it would crank out every combination of letters that is possible, like the proverbial ape with a typewriter. It would take many orders of time longer than the existence of our universe for the ape or computer to type it. But even when it did, the series of letters that composed *Hamlet* would not be, in any case, the play *Hamlet*.

IS POTENTIAL MORE IMPORTANT THAN ACTUALITY?

I want to sow here the seeds of an idea I will return to in the coming chapters: that, contrary to our usual way of thinking, potential is at least as important as, and (it may be argued) more important than, actuality. Admittedly, to a certain way of looking at it, it doesn't matter what the potential was: it's what actually happens that matters. This is undeniably true from within the frame of the actual. But the actual is smaller than, and tells us only one thing about, the field of potential. What is, through happenstance, actualised only poorly reflects one aspect of that potential. And if we are interested in the nature of reality, we are at least as interested in what it embraces as in what it has hitherto been limited to. It is possible that this is what Heidegger had in mind when he said that 'higher than actuality stands *possibility*.'¹⁰⁹ But there are a number of senses in which it appears to be true.

The unfolding of reality, in an image of Bergson's, is not like the unfolding of a lady's fan (he was writing in an era when this was a fashionable accoutrement) on which the same picture will inevitably be found, however fast or slowly one unfolds it, prefigured on the silk.¹¹⁰ Philosophers, according to Bergson, have failed to grasp the positive nature of time, its necessary role in creation of all kinds, in producing what, prior to its coming into being, is potential yet inconceivable:

They seem to have no idea whatever of an act which might be entirely new (at least inwardly) and which in no way would exist, not even in the form of the purely possible, prior to its realization. But this is the very nature of a free act. To perceive it thus, as indeed we must do with any creation, novelty or unpredictable occurrence whatsoever, we have to get back into pure duration ... Let us say then, that in duration, considered as a creative evolution, there is perpetual creation of possibility and not only of reality.¹¹¹

Duration is *durée* – time as flow; not *temps* – a succession of instants like the already present folds of the lady's fan. But note that it seems to Bergson that the unfolding of things in time does not just, as it were,

‘precipitate out’ a pre-existing potential into reality, but actually is creative of *potential itself*: ‘perpetual creation of possibility and not only of reality’. I will come to this shortly. Meanwhile let us consider the influence of what comes into being on what has already been, the past, since conventionally we see much of the potential of the present in the past. If they are seamless, then could the present influence the past?

T.S. Eliot made the point, in relation to a literary tradition, that new work in the tradition is not only formed out of the works that precede it, but in turn has an inevitable effect on how those works are henceforth experienced.¹¹² A similar point was made by Borges more dramatically: ‘The fact is that every writer *creates* his own precursors. His work modifies our conception of the past, as it will modify the future.’¹¹³ Since a work of art only fully exists in the experiencing of it, it could be argued that not just our way of experiencing it, but the underlying reality of a past work in the tradition has been changed by what comes after. Bergson seems at times to be saying that all experience is in this respect like the work of art: that what *is* only becomes fully what it *is* in the unfurling of the *whole* flow, that what *is* past only becomes what it really is once the future has unfurled. He gives this example: the Romanticism of which we now see aspects in prior Classical writers ‘no more existed in Classical literature before Romanticism appeared on the scene than there exists, in the cloud floating by, the amusing design that an artist perceives in shaping to his fancy the amorphous mass.’¹¹⁴ If Romanticism had never arisen, there would have been no prefigurings of it in Classicism.

At this point, Coleridge’s idea of the Primary Imagination may be helpful. His conception, you remember, is that Imagination is the faculty by which we nurture reality into being, not the faculty whereby we *fashion an already existing reality*. According to Coleridge, that would be, by contrast, what fantasy – or as he would have put it, Fancy – achieves: Fancy can only rearrange already existing elements of experience. Imagination, however, brings into being something never before fully experienced. Temporality, it would seem, is bound up with this crucial distinction.

Imagination alone is creative, and can deliver the truly new. In *The Master and his Emissary* I likened the left hemisphere’s ‘fantasy’ to those children’s books with pages split into three, in which you can invent a new animal by putting together the head of a camel, the body of a seal and the legs of a goat. They ‘create’ apparent newness by simply recombining in a

novel fashion, according to a formula, what is already known. Imagination, by contrast, strips the veil of familiarity from something that you thought you knew, so as to be truly revealed for the first time. At first glance, you might well think that nothing has changed, until the penny drops.

There is no possible formula for this. It's a quite different business in a range of respects. Bergson connects imagination, rightly in my view, with the necessity of abandoning any piecemeal construction of reality. Though the piecemeal mode of thought has its uses at times, it cannot discern the truly new, which always exists as a new *Gestalt*:

In psychology and elsewhere, we like to go from the part to the whole, and our customary system of explanation consists in reconstructing ideally our mental life with simple elements, then in supposing that the combination of these elements has really produced our mental life. If things happened this way, our perception would ... consist of the assembling of certain specific materials, in a given quantity, and we should never find anything more in it than what had been put there in the first place. ¹¹⁵

As he says: 'The intellect [LH] combines and separates; it arranges, disarranges and co-ordinates; it does not create.' ¹¹⁶ On the other hand, it is the nature of time as duration, which the 'intellect' (the left hemisphere) simply does not understand, to make possible an 'unceasing creation, the uninterrupted upsurge of novelty'. Speaking of the Newtonian conception of time, Smolin writes that it 'brings no novelty or surprise. Change is just a rearrangement of the same facts.' ¹¹⁷ Similarly, the misconception of determinism, the predictability of the universe, depends on the left hemisphere's reducing of time to slices and wholes to parts. What Bergson calls 'our intelligence'

imagines its origin and evolution as an arrangement and rearrangement of parts which supposedly merely shift from one place to another; in theory therefore, it should be able to foresee any one state of the whole: by positing a definite number of stable elements one has, predetermined, all their possible combinations. ¹¹⁸

As in the child's 'novel' animal picture book. But not as in *War and Peace*.

CAUSATION

Built into the idea of causation is the notion of time. Conceived as it usually is, as a linear chain of events, a cause must precede its effect. Earlier causes later. But change does not always happen, it seems, in a *linear* fashion.

Consider quantum entanglement. What this means, conventionally, is that when two particles that have interacted or been in close enough proximity that they influence each other's basic properties, and these particles are subsequently separated, a change to one particle results in a complementary change to the other at exactly the same moment. Measuring a property, such as the position, momentum, spin, or polarisation of one particle, will instantaneously bring about a change in the quantum state *both* of the particle measured *and* of the other particle with which it is said to be 'entangled', in a complementary fashion, so that it appears that the second one 'knows' instantly what happened to the first. If the first particle is in some respect 'up', the second will inevitably and instantaneously be found to be in the same respect, 'down'. The trouble is that the two particles may be separated by arbitrarily large distances, such that any information would have to have travelled many times faster than the speed of light – according to recent research at least 10,000 times faster – which is clearly impossible according to what we know, since nothing (assuming the special theory of relativity to be correct) can travel faster than light. ¹¹⁹

The only thing that we can predict will *always* occur at *precisely* the same time as a given event is – itself! So what if there is really some sense in which what we conceive as two events are in reality two aspects of one and the same event?

We may be mistaking the particle for a distinct entity instead of seeing it as simply an aspect of a whole field – when you intervene at any one point in the field, you alter the configuration of the whole field.

In Plate 22[a], we see either a woman's face in three-quarter view or a flower and a butterfly. We can see one or the other, but not both at the same time: the one excludes the other. When a transformation occurs, it is not because the nose becomes a butterfly, which then causes the mouth to become a flower, which then causes the eye to become a leaf, and so on,

each ‘passing information’ to the next: the shift happens instantaneously and as a whole.

It may be said that changes in consciousness are different in kind from changes in quantum physics. That is an assumption that may or may not be warranted, and as evidence of the inseparability of mind and matter accumulates it may be one we might need to re-evaluate. But in any case there are more homely examples that do not obviously involve consciousness. When I magnetise an iron bar, I don’t create a north pole, which magically then ‘tells’ the south pole what it must become. They always have opposite polarity and any change in one instantaneously becomes a change in the other. The system as a whole reconfigures at one and the same time.

De Broglie noted that the essence of Heisenberg’s uncertainty principle is that the projection of a *motion* to a *point* merely results in immobility – we have lost the motion.¹²⁰ Since Richard Feynman and Albert Hibbs demonstrated that the motion of a particle is continuous but not differentiable, the assumption of the differentiability (into particles) of spacetime has been called into question.¹²¹ (In fact, according to the most successful current model in physics, quantum field theory, there are in any case no particles. When a field collapses and is quantised, it looks like a particle – but isn’t.) As Stephen Robbins puts it, ‘to say this in another way, the global evolution of the matter-field over time ... cannot be treated as an infinitely divisible series of states’.¹²² Bergson anticipated non-differentiable motion of a matter-field. ‘How is it’, he wrote, ‘that we come to divide up the continuous extent of matter that we first perceive into so many *bodies*, each with its own substance and individuality?’ It’s not, he says, a matter of working out how each supposed part comes to change its position, but of how it is that there is a change in an aspect of the *whole* – ‘a change, the nature of which would remain to be determined’:¹²³

Without doubt, this continuity changes its appearance from one moment to the next: but why do we not simply note that the *whole* has changed, as if by the turn of a kaleidoscope? Why, at the end of the day, do we look in the movement of the whole for paths to be followed by bodies in motion? What we have is a moving continuum, in which everything both changes and at the same time remains: where do we get the idea of dissociating these two terms,

permanence and change, in order to represent *permanence* by bodies and *change* by homogeneous movements in space? That does not come from our immediate intuition, and, if anything, it is still less a requirement of science; for science, on the contrary, sets out to rediscover the natural seams of the universe, where we have carved it artificially.¹²⁴

Leibniz had already seen in 1671 that ‘the essence of a body consists rather in motion [than extension]’.¹²⁵ As Stephen Robbins points out, what had looked like the movements of separate objects now become changes of state in a transformation of the whole. From this perspective, what Robbins calls ‘primary memory’ – how an ‘instant’ of the past that would be by definition non-existent comes to be connected to, and interact with, the ‘instant’ that is present – ceases to be a puzzle, and becomes a property of the field itself and of its ‘melodic’ flow.¹²⁶

The principle of cause and effect breaks down at the quantum level: it appears that effects can be their own causes.¹²⁷ In relation to biology, Anjum and Mumford write:

A problem, we argue, is that if one begins from the idea that causation has to be a relation between two discrete and ‘static’ events, then it may already be impossible to formulate a satisfactory theory of what causation is and how it works. The biological case makes this quite apparent. The assumption splits the world asunder into distinct, self-contained fragments, and then tries to find a relation that would stick them all back together again. It is not clear that any relation can do that job. Even if it could, would the world with which we are left – a Frankenstein-world of stitched together pieces – have all the features we require? Would it really be a world of continuity, fit for living biological processes? ¹²⁸

The reality described by quantum field theory helps put one’s finger on the problem. Linear causation may be a valid concept, but only at one, intermediate plane of focus, neither too minute (where there are quantum fields), nor too large (where one encounters complex ‘systems’ such as organisms, and ultimately a human mind). This is in keeping with what I

suggested was the case when it came to looking at a physical entity as a mechanism: it works, but only at a quite specific scale, that of the microscopic detail. Any lower, and any higher, and it breaks down. Scale changes not just how much of some 'thing' you have, but what kind of a 'thing' it turns out to be.

THE SIGNIFICANCE OF SCALE

Linear causation is an artefact of our capacity, characteristic of the brain's left hemisphere, for shearing off from the attentional field all that does not concern us at this point – in space or time. It is like taking one arrow out of the diagram in Plate 13[a]. When one focuses on the brushstrokes in a portrait by Holbein, one can say that this application of paint here causes a darker line to appear in the face in the portrait; that the cause of the application was a movement of the painter's hand; and so on. But this, however often repeated, though it may give an apparently complete account of mechanisms involved, will never give an adequate account of how the portrait came into existence.

The Newtonian framework, says Smolin, 'is ideally suited to describe small parts of the universe, but it falls apart when we attempt to apply it to the universe as a whole ... Indeed as I will show in detail the very features that make these kinds of theories so successful when applied to small parts of the universe cause them to fail when we attempt to apply them to the universe as a whole.'¹²⁹

One benefit of a *Gestalt* view is that causality no longer looks like it has to be the best way, let alone the only way, to think about the relationship between mind and brain.¹³⁰ There may, for example, be a form of entanglement between these different levels of reality involved, as physicist Richard Muller has suggested.¹³¹ When two particles of matter are entangled, no one particle *causes* the other's behaviour; they are, it seems to me, best considered as aspects of one and the same event. During life it is possible that the spiritual and physical are entangled, neither *causing* the other, neither *depending* on the other for its existence, but their entanglement certainly depending on the co-existence of each: nonetheless each could exist separately, though then they would not exhibit the entanglement we recognise as the mind-brain relationship.

When I was discussing the distinctive features of organisms in Chapter 12, I suggested there were difficulties in applying linear causation to a waterfall or a tornado. In a flow, there are no clear trains of causation, with their one-to-one relationships of before and after, and a definable beginning and end. Schelling argued that mechanical cause-effect relations are

abstractions from the reciprocal causation of self-organising processes.¹³² An organic whole, in contrast to a mechanism, does not consist of a hierarchy of parts which exert control over other parts. Instead, it is a maximally responsive and transparent system in which changes and adjustments propagate *simultaneously* upwards, downwards and sideways, in the maintenance of the whole.

Instead of ‘control’ (LH), I suggest it is more appropriate and more fruitful to think in terms of ‘communication’ (RH).¹³³ ‘It is assumed that we are both entitled and able to dismember the continuous flow of events’, wrote FCS Schiller,

to dissever it into discrete stages, to distinguish certain elements in the infinitely complex whole of phenomena, and connect them with others as their causes or effects. But what if the Becoming of things be an integral whole, which could be understood only from the point of view of the whole? Would not the idea of causation be inherently invalid, just because it *isolates* certain factors?¹³⁴

One way to think of a cause is ‘that without which something would not be’ – something which can, in a sense, take credit (or blame) for its coming about: this is approximately the root meaning of the word Aristotle uses for a cause, αἰτία (*aitia*). One can then distinguish different types of such ‘without-which-nots’, as, famously, does Aristotle, into four kinds: *material*, *formal*, *efficient*, and *final* causes. Take, for instance, a horseshoe: its *material* cause is metal; its *formal* cause is its characteristic shape; its *efficient* cause is the skill of the blacksmith; and its *final* cause (its purpose) is the preservation of a horse’s hoof. Of these, the final cause, where there is one, has precedence over the others as the cause that best explains ‘the reason why’ there is a horseshoe.¹³⁵

All this can be useful, in the way that analysis is, in making distinctions among apparent similarities. But it also sets up artificial barriers to seeing what is in front of you: that things are the way they are for a host of reasons that are literally endless and overlap. Borges again: ‘There is no act that is not the coronation of an infinite series of causes and the source of an infinite series of effects.’¹³⁶ In causative chains, say that of the horseshoe, there are proximal (immediate) causes and ever more distal (remote) ones –

the cause of the metal is a whole narrative – or *relation*, as we say – of events, involving ancient geology and modern mining and smelting at the very least. And so with the shape; and so with the skill of the blacksmith (a no doubt complex narrative, both personal and cultural); and the purpose of the *narrative* is to explain why there is a horseshoe at all, a narrative which culminates in the reason it was made, to protect the horse's hoof – which is an instance of the future extending an influence back into the past. Chains of causation are conceived as working from the past towards the future: but the future, in the sense of internalised potential, pattern or *telos*, the drive that is in all living beings, may be as important a driver in the emergence of phenomena as the past.

Only a privative focus on detail delivers the clear cause and effect mechanism. Does the trumpeter cause a sound, or the trumpet – or is it the air blowing through it that causes the sound? Or the trumpeter's lungs, or the listener's ear? Or the instrument maker's skill? Or Handel, who wrote the music? Or all their parents for bringing them into being? Or the musical history of Europe? Or – the audience that *will* hear the performance tomorrow?

Here I am reminded of the work of Schelling, and his contention that, viewed correctly,

the individual successions of causes and effects (that deceive us with the illusion of a mechanism) disappear, being infinitely small straight lines in the universal curvature of the organism, in which the world itself runs continually onward.^{[137](#)}

Curvature: whereby what was prior can also influence what was former. Once again shape is a key to seeing the limitations of a certain kind of thought.

Bergson's all-important distinction between slices and flow opens our eyes to the distinction between a narrow view of causation as a linear sequence of discrete events, leading to determinism, on the one hand, and the autonomous reconfiguration of an indivisible, fluid form field or *Gestalt*, on the other.

THE PRESENT IS NEVER AN INSTANT BUT HAS THICKNESS

There is no point that is ‘now’, distinct from the immediate past and the immediate future – your consciousness straddles this supposed divide in a seamless way. There is no separate point of stasis in a stream: just longer and shorter stretches of flow. Awareness of the past always takes part in the present and the amount varies in extent depending on the type of attention you pay, the mood you are in, and other factors; it may extend back into the past, or away into the future, not just for seconds, but for days, or even years. It is only the deceptive habit of comparing time visually with space that makes us think of it as made of moments.

Whatever I am today includes my history over many decades, and the history of the culture and society that have formed me, and ultimately the history of humankind; all that partakes in, and is present in, exactly what I am *right now*. My body is history, and I am, at least in part, my body. Memory is stored everywhere in it. My body also anticipates the future, not just in the sense that I think about what is to come, but at an embodied, unconscious, even cellular, level an organism is acting *towards* certain outcomes, not merely passively responding to what has already happened. Equally my perceptions (what I am able to perceive), my interests (where I am directing my attention) are governed by the future, as well as the past: my aims and interests, where I project, and how I conceive, not just *my* future, but the future of us all. Bergson saw not only that the present has thickness, a thickness that is not circumscribed by any formula, or by any general prediction; but that the thickness varies and that this helps us to make sense of memory. The present is something ‘thick, and furthermore, elastic, which we can stretch indefinitely backward by pushing the screen which masks us from ourselves farther and farther away’.¹³⁸ Elsewhere he writes:

The distinction we make between our present and past is therefore, if not arbitrary, at least relative to the extent of the field which our attention to life can embrace. The ‘present’ occupies exactly as much space as this effort. As soon as this particular attention drops

any part of what it held beneath its gaze, immediately that portion of the present thus dropped becomes *ipso facto* a part of the past. In a word, our present falls back into the past when we cease to attribute to it an immediate interest ...¹³⁹

And this present, in as much as it includes elements of the past, does not do so by ‘containing’ a series of stills from our earlier life:

An attention to life, sufficiently powerful and sufficiently separated from all practical interest, would thus include in an undivided present the entire past history of the conscious person, – not as instantaneity, not like a cluster of simultaneous parts, but as something continually present which would also be something continually moving: such, I repeat, is the melody which one perceives as indivisible, and which constitutes, from one end to the other – if we wish to extend the meaning of the word – a perpetual present, although *this perpetuity has nothing in common with immutability, or this indivisibility with instantaneity*. What we have is a present which endures.¹⁴⁰

A present which endures. Compare the physicist Erwin Schrödinger: ‘the present is the only thing that has no end.’¹⁴¹ Thus, says Bergson, what is in need of explanation is not memory, but its ‘apparent abolition’. He sees this as one of the primary functions of the brain (we might now say of the left hemisphere’s conscious mind), to abolish memory: to lose ‘irrelevant’ experience, what is no longer of immediate use.¹⁴²

According to Merleau-Ponty,

a past and a future spring forth when I reach out towards them. I am not, for myself, at this very moment, I am also at this morning or at the night which will soon be here, and though my present is, if we wish so to consider it, this instant, it is equally this day, this year or my whole life.¹⁴³

These *tempora* do not, he says, need to be artificially synthesised: from the standpoint of experience, rather than any ‘external’ perspective, they seamlessly interpenetrate one another.

Though of course Merleau-Ponty does not intend that the past and the future should be thought of as symmetrical, there is a semi-automatic tendency to think of them as loosely symmetrical, in that they are both supposed to be equally ‘unreal’, and from the spatialised viewpoint they fall on a timeline with the past on one side and the future on the other side of the instantaneous ‘now’. But they are *not at all* symmetrical, and this only points to the fallacy of the spatialisation and abstraction of time. Apart from the obvious experience that time’s arrow moves only one way, so that the past is always growing while the future diminishes (unless each is infinite), the past has been ‘passed’ through the filter of being present, in the process acquiring embodiment, richness of human meaning and uniqueness. By contrast, the future is a theoretical projection, general, disembodied, and free to accept whatever meanings we care to throw at it. In that sense the future is *all theory*.

One would therefore expect the past to be of greater concern to the right hemisphere, and the future to the left hemisphere. Some evidence tentatively points to this being the case.¹⁴⁴ It is also clinically observable that in mania, in which the left frontal pole is dominant, subjects are orientated almost entirely towards the future, with completely unrealistic plans and projections, and seem shielded from thoughts of the past – they cut themselves off from their emotional history; whereas in melancholy, in which the right frontal pole is dominant, subjects are unable to free themselves from regretful thoughts of the past – of the bad that should not have happened and of the good that is lost – and shun the future.

TIME IS SHAPED BY OUR SENSE OF VALUE

This reminds us that our immediate concern, and the nature of our attention, alters time. A period that seems to pass particularly slowly at the time (eg, a period of depression) is in retrospect remembered as being relatively short, rather than relatively long: its emptiness prolongs it when experienced (presumably because we are too focussed on its passage, rather than taken up in engaged activity), but collapses it in retrospect (nothing ‘there’ to remember).

Why does time speed up as we get older?¹⁴⁵ A number of theories have been put forward, but I think there are three principal factors that influence the speed with which time passes for most of us.

The first is the affect which attaches to the future compared with the affect which attaches to the past. In very early childhood, neither past nor future obtrude. Then, as the child grows, the future is increasingly longed for and is full of fantastic possibility, while the past is not, to any important extent, affect-laden: it does not draw us back. Hence time moves slowly in childhood, because, compared with our longing for the future, our ‘shared’ time seems to move too slow. In age, by contrast, the future is feared, and the past is highly charged with meaning – more than the present or future could be – and that draws us back: hence ‘shared’ time seems to us to be moving on too fast.

The second is the degree of absorption in the present moment. A child is completely taken up in play and directed towards his or her immediate goals: a child’s time could therefore be said to be implicit. This implicit time is there for us, too, but normally overlaid by objectification. When we are absorbed, neither time nor our embodiment is in the foreground of our attention: when I am a lived body, I live time. But when I become consciously aware of my body as an object, time too comes to the foreground. When we are in the flow of life as Bergson remarked, ‘there is neither a rigid, immovable substratum nor distinct states passing over it like actors on a stage. There is simply the continuous melody of our inner life.’¹⁴⁶

While singing in a choir, or joining in a dance, or absorbed in a task requiring skill, or merely absorbed in thought, time appears absent – it no

more obtrudes on our attention than does our body; though when finished, the sudden consciousness of what has happened in the world of ‘shared’ time makes time appear to have moved fast. Hence the folk wisdom that ‘time flies when you are having fun’. These are the so-called flow experiences made famous by the Hungarian psychologist Mihály Csikszentmihályi, in which time effectively stands still; in which, to quote Thomas Fuchs, ‘the sense of time is lost in unimpeded, fluid performance’.¹⁴⁷ As we get older we get less good at allowing ourselves to be absorbed in activities without keeping a watchful eye on time, ‘looking before and after’, as Hamlet says, and time becomes more pressing. It is less embodied, less *lived*: more like a fretful travelling companion. ‘When we dwell in the past or become fixated upon the future’, writes Glenn Parry, a psychologist with a special interest in Native American culture,

we become unbalanced and can literally make ourselves ‘time-sick’. Time-sickness is an artifact of the confusion about time. I believe it is actually a form of homesickness, because what we are missing, without realizing it, is a time when we lived in continuous connection with our homeland.¹⁴⁸

That homeland is time’s *flow*.

And the third factor that affects the speed of passing time is the degree of conformity of our experience to expectation. When unaccustomed things happen, and there is a break with routine, time slows down; ¹⁴⁹ a weekend away from home, exploring somewhere new, can seem to have lasted a week. However, when everything is familiar, time speeds up. When we are young all is new: not so in age. This may be another good reason for practising mindfulness, which makes everything new once more.

CLOCK TIME VS LIVED TIME

Lee Smolin makes an observation that is interesting in the light of the hemisphere hypothesis. All established theories of physics, he points out, share a feature which makes them difficult to extend to the whole universe. For purposes of utility, one feigns to hold one part of reality fixed and invariable, when in reality it is not; and this allows one to observe an effect within a confined system which is allowed to move and change.

Each divides the world into two parts, one that changes over time and the second assumed to be fixed and unchanging. The first part is the system being studied, whose degrees of freedom change with time. The second part is the rest of the universe; we can call it the background ... A distance measurement implicitly refers to the fixed points and rulers needed to measure that distance; a specified time implies the existence of a clock outside the system measuring the time ... The division of the world into a dynamical and a static part is a fiction, but it is an extremely useful one when it comes to describing small parts of the universe. The second part, assumed to be static, in reality consists of other dynamical entities outside the system being analysed. By ignoring their dynamics and evolution, we create a framework within which we discover simple laws ... The division of the world – into a dynamical part and a background that surrounds it and defines the terms with which we describe it – contributes to the genius of the Newtonian paradigm. But it is also what renders the paradigm unfit for application to the whole universe.¹⁵⁰

The ruse is useful in helping us get a grasp, but at the expense of misrepresenting all of reality not encompassed in the system.

In his book on consciousness, *Out of My Head*, Tim Parks makes a nice observation: ‘If there is one thing that is not a reliable measure of chronometric time, it is human experience. Or to put it another way: if there is one thing that is not a reliable measure of human experience, it is chronometric time.’¹⁵¹ What is often called ‘subjective’ time is not unreal:

it is the most real that time can be. Clock time is real, too, but it is just a much more restricted aspect of time. Einstein, in a moment of frustration, stated that ‘the time of the philosophers does not exist’.¹⁵² This is no truer than that ‘the time of the clockmakers, the measurers, does not exist’.

Minkowski refers to Bergson’s concept of the *élan vital*. This concept has been comprehensively misunderstood, a misunderstanding that largely stems from a process of Chinese whispers, which is both the effect and the cause of people no longer troubling to read him. It is popularly imagined to refer to some hitherto undiscovered physical substance that magically confers life, much as scientists used to believe that a substance called phlogiston was responsible for the phenomenon of fire.

In fact Bergson refers to something quite different in kind, which in the rest of this chapter I will attempt to convey to the reader. Consciousness is always of something else: to use the jargon, it is said to be ‘intentional’, and therefore essentially both directed and dynamic. The *élan vital* is the drive inherent in consciousness, within something that is valued towards something that is valued. This is what Merleau-Ponty referred to as the ‘intentional arc’ of directed activity, ‘the overriding temporal forms whereby our apprehension (eg, of a melody) and action (eg, speaking a sentence) takes place.’¹⁵³ Fuchs says of this basic energetic momentum of mental life that it

is the root of spontaneity, affective directedness, attention and tenacious pursuit of a goal, which are characteristic of living beings generally, but it also lends the ‘intentional arc’ the tension and energy it needs.¹⁵⁴

Jacques Ellul remarks that

motion is the spontaneous expression of life, its visible form ... [Yet nowadays] motion is dissected into discrete aspects so that its form appears phenomenally, point by point. The immediate consequence of such analysis is that motion becomes completely disjoined from person and internal life ... Action is no longer a real function of the person who performs it; it is a function of abstract and ideal symbols, which become its sole criteria.¹⁵⁵

Abstract and ideal symbols: clocks are like words, or like money. They take part in a structure that runs *parallel with* the real world, and each can carry out internal transactions in its own realm. But all of these – language, money and clock measurements – must at some point ‘cash out’ in the experience they parallel, where alone they have meaning. And in reality time is not regular; as Borges put it, ‘Time can’t be measured in days the way money is measured in pesos and centavos, because all pesos are equal, while every day, perhaps every hour, is different.’¹⁵⁶ To see only clock time is to miss most of its meaning. I am reminded of Blake’s saying: ‘The hours of folly are measur’d by the clock; but of wisdom, no clock can measure’.¹⁵⁷

While asserting the all-pervasive reality of time, astrophysicist Michael Shallis observes:

The techniques of instructional science cannot handle individual experience or admit to the quality of time. [Whereas] descriptive science can ... the fact that the experience of time is not quantifiable puts it into that arena of human perceptions that are at once richer and more meaningful than are those things that are merely quantifiable ... The lack of quantification of temporal experiences is not something that should stand them in low stead, to be dismissed as nothing more than fleeting perceptions or as merely anecdotal; rather that lack should be seen as their strength. It is because the experience of time is not quantifiable and not subject to numerical comparison that makes it something of quality, something containing the essence of being ...¹⁵⁸

Clock time is invented time, but man has been too gullible, he has ended up believing that his invention has an objective existence ... Objective time, clock time, exists because the mind invented clocks. That invention gave us a definition of an apparently objective time that we believe in too much ... [However] objective time has gone. It has gone in relativity, gone from the quantum world, gone in cosmology ... Only in the ‘normal’ world, which has been impoverished by our definitions and explanations which define poorly and explain little, does objective time still hold sway.¹⁵⁹

In the immediate aftermath of her left hemisphere stroke, the neuroanatomist Jill Bolte Taylor found that she had to work out how to move. But once this had settled, she

sensed the composition of my being as that of a fluid rather than that of a solid. I no longer perceived myself as a whole object separate from everything. Instead, I now blended in with the space and flow around me ... I felt truly at one with my body as a complex construction of living, thriving organisms.

Later that same day she found that, with her left hemisphere no longer functioning normally, she ‘also lost the clock that would break my moments into *consecutive brief instances*’.¹⁶⁰

Those who try to speak about time, find themselves, according to Waismann,

pulled to and fro: ‘I’m always in the present, yet it slips through my fingers; I am going forward in time – no, I am carried down the stream’ ... *one* answer will never do.¹⁶¹

One reason we are pulled to and fro is that we try to combine an objectified image of time seen from the outside, with the experience of time as inhabited. Such an attempt is never completely successful. Bergson likens it to the impossibility of achieving the experience of walking around a town by compiling a potentially infinite number of still photographs from every conceivable angle; or, in poetry, of achieving the effect of the original by a translation. However much you carry on ‘perfecting’ it, then adding comments on your translation, and commenting on your comments, piling explanation on explanation, you can never quite, though the process be carried on to infinity, reach the simple effect of the original:

the object and not its representation, the original and not its translation, is perfect, by being perfectly what it is. It is doubtless for this reason that the *absolute* has often been identified with the *infinite*.

The absolute has this in common with the infinite, that it can never be reached, so that progress is always asymptotic, like trying to approximate a curve using straight lines. Anything that is *sui generis*, incomparable to anything else and indecomposable into parts, shares this seemingly infinite quality. Unsurprisingly, then, time and movement share the characteristic:

When you raise your arm, you accomplish a movement of which you have, from within, a simple perception; but for me, watching it from the outside, your arm passes through one point, then through another, and between these two there will be still other points; so that, if I began to count, the operation would go on for ever. Viewed from the inside, then, an absolute is a simple thing; but looked at from the outside, that is to say, relatively to other things, it becomes, in relation to these signs which express it, *the gold coin for which we never seem able to finish giving small change*. Now, that which lends itself at the same time both to an indivisible apprehension and to an inexhaustible enumeration is, by the very definition of the word, an infinite. ¹⁶²

TIME AS NECESSARY FOR INDIVIDUATION

In Chapter 9, I commented on the way that the loss or disruption of experienced time in schizophrenia had, among its many effects, that of devitalisation. Impermanence is vital, in the original sense of that word. ‘Time is immediately given’, writes Bergson. ‘That is sufficient for us, and until its inexistence or perversity is proved to us we shall merely register that there is effectively a flow of unforeseeable novelty’.¹⁶³ The existence of time is inseparable from the evolving of difference and variety: therefore from freedom and creativity. Without time there is no principle of individuation, no human *being*, with its situation in the world, its capacity to feel, to act, and to relate to the cosmos at large.

‘The continuing allure of Platonism’, wrote Sherover,

may well be, as Heidegger once suggested, a sign of a continuing attempt to escape temporality. On any kind of Platonism, it is hard to see how one can explain why or how a completely atemporal realm of true ‘reality’ could or should bring a temporal order into being.¹⁶⁴

There are two questions here: how could it, and why should it? On the first question, I am with those who would argue that time could not, and did not, arise from the atemporal; that time is an ontological primitive. On the second question, we are in the realm of speculation, but a starting point might be that only time can lend the *freedom* for individual elements of creation to come into being, and to have any meaning whatever:

As absolute ... the world repels our sympathy because it has no history. As such, the absolute neither acts nor suffers, nor loves nor hates; it has no needs, desires, or aspirations, no failures or successes, friends or enemies, victories or defeats. All such things pertain to the world *qua* relative, in which our finite experiences lie, and whose vicissitudes alone have power to arouse our interest ... The doctrine on which the absolutists lay most stress is the absolute’s ‘timeless’ character. For pluralists, on the other hand,

time remains as real as anything, and nothing in the universe is great or static or eternal enough not to have some history.¹⁶⁵

Indeed only ‘in the world of finite multifariousness ... does anything really happen, only there do events come to pass.’¹⁶⁶ An immaculate vacuity is no contest for the vibrant imperfection of reality.

To have no history is not to exist; and to have a history of any kind is necessarily to exist in time. Time is the force field of individuation. Left hemisphere aspirations, embodied in much of the mainstream of Western philosophy for two thousand years following Plato, entail there being a single timeless unchanging unity, in which true creativity, individuation, and history come to be merely illusions, or at least fallings away from an ideal. Yet time is not simply a force for differentiation, but also for cohesion: it not only extends forwards and backwards along what seems like a line, but, as ‘intersubjective time’, also underwrites rhythms and cycles that keep different organic entities, and different levels of the same organic entity, entrained with one another. Rhythms, and rhyme, can exist only in time. Rhythms – regular vibrations and oscillations – are fundamental to the physics of the universe as much as to music, to brain function as much as to poetry, to nature’s seasons as much as to the proper functioning of the body: science discloses them everywhere. And rhyme requires both separation in time and yet a binding together across time, sameness and difference, in which, as in a musical phrase, the past is made to resonate with the present. (I will have more to say about rhythm in Chapter 23.)

Borges expresses memorably the relation between time and individuation:

To deny temporal succession, to deny the ego, to deny the astronomical universe, are apparent desperations and secret assuagements. Our destiny ... is not horrible because of its unreality; it is horrible because it is irreversible and ironbound. Time is the substance I am made of. Time is a river that carries me away, but I am the river; it is a tiger that mangles me, but I am the tiger; it is a fire that consumes me, but I am the fire. The world, alas, is real; I, alas, am Borges.¹⁶⁷

Borges is humorously, and humanely, pessimistic. But the words ‘irreversible and ironbound’ compel us to note that this view of time is applicable only when we retrospect. Nothing can undo time, true; but the pay-off is that we are free to choose in prospect – only because time exists. Perhaps it is the burden of freedom that proves ‘horrible’.

According to Heidegger, the sense, the point, the very meaning of *Dasein* (each existing human being) is temporality: in his words, ‘*Der Sinn des Daseins ist die Zeitlichkeit*’.¹⁶⁸ The German word *Zeitlichkeit* is not so thoroughly technical and alien-sounding as temporality, something more like ‘having the nature of time’. And so one might say that ‘the meaning of human being is being *with* time’. The point is not the obvious one, that whatever we do we cannot escape the clutches of an external constraint called time, but that time is right at the core of our being: not an incidental, perhaps lamentable, aspect of the human condition, that in a better-ordered world would not – does not, according to Plato – exist. Heidegger’s idea is not far from a saying of Merleau-Ponty: ‘We must understand time as the subject and the subject as time’, where, by ‘the subject’, Merleau-Ponty means human consciousness.¹⁶⁹ Our consciousness depends on time, and we humans have no meaning, and can find no meaning, outside time. That is one reason why Heidegger called *Dasein* the being-towards-death (*Sein zum Tode*).

In talking about time, Bergson sometimes uses the image of the colour spectrum, in which there is both continuity and maximum differentiation at once. What is more, none of the differentiations disrupts its continuity as a whole; the colours cannot be demarcated, merely indicated. As always, we need both differentiation *and* union, an idea so fundamental that one would anticipate its being built into the structure of the physical world both in space and in time.

I believe it is. Physics must speak of both waves and particles, or better still, as quantum field theory suggests, continuous fields and their ability to collapse instantaneously into quanta – discrete units. But, as we have seen, even discrete quanta, having interacted, appear linked in such a way that a change in one causes an instantaneous change in the other, even though the quanta are separated too far for information to have travelled between them in the available time. Perhaps more surprising to the reader may be to realise that physicists recently demonstrated that entanglement exists not just over space, *but over time*. They ‘generated and fully characterized an

entangled pair of photons that have never coexisted’.¹⁷⁰ These findings together are of considerable significance for a question that recurs throughout this book: how the parts relate to the whole.

My theme has been that the parts of ‘things’, most especially living organisms, are never isolated one from another. The finding of quantum entanglement in space, and now in time, underlines how fundamental this truth is to the structure of the world. As the researchers themselves point out, the apparent

‘puzzle’ of how parts fit with an overall whole presumes clear-cut spatial boundaries among underlying components, yet spatial nonlocality cautions against this view. Temporal nonlocality further complicates this picture: how does one describe an entity whose constituent parts are not even coexistent?

Try a family, a culture, a civilisation. ‘Nonlocality’, Gleiser tells us, ‘is an indelible feature of entanglement, and entanglement is an indelible feature of quantum mechanics.’¹⁷¹ And of the living world.

TIME AND ETERNITY

As we have seen, Bergson remarked that ‘that which lends itself at the same time both to an indivisible apprehension and to an inexhaustible enumeration is, by the very definition of the word, an infinite.’

Infinity in time is eternity. How can we relate time and eternity? If ever there were a topic that represents the gold coin for which we never seem able to finish giving small change, infinity must by definition be it.

I quoted Schrödinger’s ‘the present is the only thing that has no end.’ There is a danger that any discussion of time and eternity leads to an infinite regress. Naturally we cannot conceive eternity except by means of time, and so all discussion of their relationship runs the risk of describing a snake that bites its own tail. Either time eats eternity or eternity swallows up time, depending on how you look at it. Merleau-Ponty exemplifies this problem when he prioritises time, by saying that ‘the feeling for eternity is a hypocritical one, for eternity feeds on time. The fountain retains its identity only because of the continuous pressure of water.’¹⁷² The French existential philosopher Louis Lavelle takes us more in the opposite direction – Schrödinger’s direction – when he says that

there is no true novelty other than the discovery, at every moment of time, of an eternity which delivers us from time ... Infinity is the negation of the end, and therefore of the way. It is itself the end, and the way. And the soul finds her equilibrium and her security only when she fixes her eyes on infinity *present here and now*, and has ceased to relegate it to an eternal beyond. ¹⁷³

So, the claim is, eternity is now and now is eternity. I feel the Zen saying ‘Yes, but ...’ coming over me. In this respect, I found this passage from the journals of Alexander Schmemmann thought-provoking:

It seems to me that eternity might be not the stopping of time, but precisely its resurrection and gathering. The fragmentation of time, its division, is the fall of eternity.

The fragmentation of time is exactly what we have been dealing with, here and in Chapter 16, and what Schmemmann is saying is that this process not only denatures time but denatures eternity, that time and eternity are not enemies but stand or fall together. It is, I think, a powerful insight that to stop time would be to stop eternity. And he continues:

The thirst for solitude, peace, freedom, is ... thirst for the transformation of time into what it should be – the receptacle, the chalice of eternity ... There are two irreconcilable types of spirituality: one that strives to liberate man from time; the other that strives to liberate time. In genuine eternity, all is alive.¹⁷⁴

‘These two ways of thinking, the way of time and history and the way of eternity and of timelessness’, said Robert Oppenheimer in his Reith Lectures, ‘are both part of man’s effort to comprehend the world in which he lives. Neither is comprehended in the other nor reducible to it. They are, as we have learnt to say in physics, complementary views, each supplementing the other, neither telling the whole story.’¹⁷⁵

My own take on eternity is dependent on another insight, that of the poet Blake, who famously wrote of holding ‘infinity in the palm of your hand, and eternity in an hour’. For him, eternity was not a number that you reached by adding serially, unit by unit, left hemisphere fashion, but required a leap to a different understanding of reality altogether – as much a *qualitative*, as a quantitative, leap. Which is why infinity can fit in the palm of your hand, and eternity in an hour. Borges’s remark that ‘everything happens for the first time, but in a way that is eternal’, expresses, I believe, a similar idea: eternity is not a thing, or amount, or measure, but a quality – a way of being: and everything that is present has – or can have – this quality.¹⁷⁶ Perhaps, one could say, eternity is more – like time itself – an adverb, not a noun.

At the other end of the scale from the supposedly infinitely large, we can use the same insight to understand the supposedly infinitely small: the ‘moment’. Although – and indeed precisely *because* – a moment can have no dimensions, it is not something atomistic. We may be encouraged to think in that way by the legacy of Aristotle, who likened ‘the now’ to a point. However, the ‘moment’ as referred to by Eastern sages such as

Dōgen is entirely without dimensions, and is thus ‘simultaneously unmeasurably brief and everlasting, always present’.^{[177](#)} To quote Kierkegaard,

Thus understood, the moment is not properly an atom of time but an atom of eternity. It is the first reflection of eternity in time, its first attempt, as it were, at stopping time.^{[178](#)}

SOME BRIEF REFLECTIONS ON THE DEBATE IN PHYSICS

This leads to consideration of time at the cosmic level. Scientists continue to argue about whether time exists or not. But most of these arguments, I believe, involve a fallacious choice: either there is left hemisphere time (Bergson's *temps*), time which has points, and measures the difference between points – clock time; or time does not exist, and in its place is the other classic left hemisphere conception, a Platonic, timeless, 'block universe', as physicists refer to it.

But these are not the only options. All things change, always: this the right hemisphere sees. 'Now' may be the only place we can inhabit, but it is not a point. Bergson's *durée* is something different: it flows. Flow is not, as we have seen, a series of slices, of train trucks, a succession of moments or points, gone as soon as they have come: nor is time. When you are properly in the flow *you do not experience time passing because you are flowing with it*. But it is there all the same in the flow.

I mentioned the Block Universe. There are three main contending models amongst physicists in relation to time:

The Block Universe (the large solid): the past, present and future are all equally real; there is no privileged or moving present – every event is present at the time when it occurs, just as every *place* is a 'here'.

Presentism (the small sliver): the universe consists of a succession of momentary (or very brief) phases; since only one of these presents is ever real, the past and future have no reality at all – they don't exist.

The Growing Block (the medium-sized solid): the present and the past both exist, only the future is wholly unreal; since new 'slices' of reality – new presents – are being created, and once created these remain in existence, the universe is constantly growing.¹⁷⁹

His vision of a Block Universe led Einstein to claim that time did not exist:¹⁸⁰ indeed, Gödel thought that at last Einstein had bequeathed us a world without time.¹⁸¹ But as the philosopher JR Lucas says: 'The block

universe gives a deeply inadequate view of time. It fails to account for the passage of time, the pre-eminence of the present, the directedness of time and the difference between the future and the past' – in other words, just about everything that goes to constitute our idea of time.¹⁸²

From a hemisphere point of view both Presentism and the Block Universe are typical left hemisphere constructs: either the whole thing is static, or it is made up of an effectively endless number of bits that are static.

As long as it does not depend on the acquisition of 'slices', the Growing Block seems more probable than the others, which just repeat the left hemisphere inabilities to deal with time: in the 'slices' version it, too, falls prey to the same problem. But why a 'block' at all? An improvement may be achieved by the model of cosmologist George Ellis, for whom time is a primary entity, one that can be understood by picturing an evolving universe, in which there is a growing 'volume' of spacetime. The surface of this volume can be thought of as the present moment. The surface represents the instant where 'the indefiniteness of the future changes to the definiteness of the past', thus 'spacetime itself is growing as time passes.'¹⁸³

There is support from physics for the idea that time is more fundamental even than space. According to the Conformal Cyclic Cosmology (CCC) model put forward by Roger Penrose and Vahe Gurzadyan, in which universes succeed one another in time, transmitting information at the moment of transition, space is seen as 'essentially a geometrical construct', and the model 'relegates it [space] to an emergent phenomenon. Instead, it [the model] perceives the notion of time, and thus the flow of informational entropy, as more fundamental.'¹⁸⁴

A further observation from physics is that the idea that time is an illusion is not consonant with the discovery that time's arrow cannot, after all, be reversed in the models of quantum mechanics and quantum field theory, the best models we have of the physical universe. As the Japanese theoretical physicist Satoshi Watanabe first demonstrated, and as Andrew Holster has since confirmed, 'when the analysis is done correctly, it is clear that quantum mechanics is *time asymmetric (irreversible)*. The probabilistic laws of quantum mechanics *simply do not hold of time-reversed quantum processes*.'¹⁸⁵ Dieter Zeh has also more recently argued this position in a series of papers, as have a number of other physicists.¹⁸⁶ But in 1996, Ilya

Prigogine had already noted that time's irreversibility was another aspect of the fruitful asymmetry at the core of things:

it is precisely through irreversible processes associated with the arrow of time that nature achieves its most delicate and complex structures. Life is possible only in a nonequilibrium universe. Nonequilibrium leads to concepts such as self-organisation and dissipative structures ...^{[187](#)}

Not only is time obstinately real, but unfailingly creative. 'The only kind of universe that appears natural from the timeless perspective of the Newtonian paradigm is a dead universe in equilibrium', writes Smolin,

... obviously not the kind we live in ... But from the perspective of the reality of time, it is entirely natural that the universe and its fundamental laws be asymmetric in time, with a strong arrow of time that encompasses increases of entropy for isolated systems together with continual growth of structure and complexity.^{[188](#)}

TIME IS ESSENTIAL TO BEING IN THE WORLD

I began this chapter by quoting Schopenhauer's saying that to think away time and space is completely impossible. 'To think away time', writes Roger Scruton, 'is to think away myself. Indeed, it is to think away the whole observable world.'¹⁸⁹ As for me, I consider time as real as anything I can know. To quote Smolin again:

I no longer believe that time is unreal ... Not only is time real but nothing we know or experience gets closer to the heart of nature than the reality of time ... I will propose that time and its passage are fundamental and real and the hopes and beliefs about timeless truths and timeless realms are mythology ... Nothing transcends time, not even the laws of nature. Laws are not timeless. Like everything else, they are features of the present, and they can evolve over time.¹⁹⁰

Later he writes that, if we want to survive as a species,

we have to understand the roots of the distinction between the artificial and the natural. These have a great deal to do with *time*. The false idea we have to put behind us is the idea that what is bound in time is an illusion and what is timeless is real.¹⁹¹

This misconception underlies two thousand years of Western philosophical misjudgment.

Time is recalcitrant to thought in the left hemisphere sense of the word, and so I understand why it is tempting to 'think it away'. Yet a world without time is also unthinkable – literally inconceivable. For time is foundational to everything that exists. 'Were time to cease to exist, so would mountains and oceans cease to exist', wrote the thirteenth-century Zen master Dōgen.¹⁹² Mountains flow, over time; oceans have tides, and flow. In other words, everything flows. Everything is extended in time.¹⁹³ According to Prigogine,

... the big bang was an event associated with an instability within the medium that produced our universe. It marked the start of our universe but not the start of time. Although our universe has an age, the medium that produced our universe has none. Time has no beginning, and probably no end.¹⁹⁴

In an interesting examination of this issue, it has been argued at book length that even the conception of God as outside time must be mistaken.¹⁹⁵

The essence of time is recalcitrant to thought because it is recalcitrant to language, as Augustine of Hippo most famously declared (I hope he may forgive my interpolations):

Who even in thought can comprehend it, even to the pronouncing of a word concerning it? But what in speaking do we refer to more familiarly and knowingly than time? ... What, then, is time? If no one ask of me, I [RH] know; if I wish to explain to him who asks, I [LH] know not.¹⁹⁶

The speaking hemisphere's re-presenting, rationalising tendency 'has the ability to isolate, immobilise and spatialise the flow of lived experiences inherent in *durée*, making them accessible to verbal description and analytic reflection',¹⁹⁷ but in the very fact of isolating and immobilising time it has lost the only elements of importance that it might have grasped: its universal nature and its motion. Language is a tool of convenience before it is anything else. As William James says: 'the concepts we talk with are made for purposes of *practice* and not for purposes of insight.'¹⁹⁸

It may be said that here I am talking about experiential time, but that this gets us no nearer to the *reality* about time: the reality might be that it is an illusion after all. But for a scientific theory to be successful, it must explain the observations we make of nature; and 'the most elemental observation we make is that nature is organised by time'.¹⁹⁹ To regard time as a 'mistake' of experience is, in the words of philosopher Yuval Dolev, to remove 'all of experience from reality to the point of leaving empirical science, science based on experience, without trustworthy input to feed on ... discrediting experience to such an extent fatally cripples the very mechanisms through which the theory of relativity was arrived at to begin

with.’²⁰⁰ If we dismiss perceptual experience as a source of knowledge, we pull the rug from under the feet of science. And since we can only know anything about time by virtue of our consciousness, any attempt to know what it would ‘really’ be like outside of consciousness cannot succeed (indeed the very idea that reality is found by subtracting consciousness is fundamentally mistaken). It would be like trying to take a glimpse of what something looks like when it is not being looked at. What’s more, time must be asymmetrical if science is to have a basis: ‘Physics would not be possible at all’, writes philosopher Michael Drieschner, ‘if we did not start from this “direction” of time’.²⁰¹ As Merleau-Ponty says, the only thing that does not pass in time is the passing of time itself.²⁰²

If one espouses a view of the world as a flow, not as a collection of things, then all that exists is not just, inertly, being, but always ‘be-coming’; and time and movement is bound up in that very concept. As it is written in the *Chuang Tzu*:

There are no fixed limits
Time does not stand still.
Nothing endures,
Nothing is final.
You cannot lay hold
Of the end or the beginning.
...
The game is never over,
Birth and death are even,
The terms are not final.²⁰³

Time is, in other words, according to this account, the condition of existence. And, as the rest of the passage from the *Chuang Tzu* goes on to say, in time our perspective changes, and what before seemed so important seems less, and what once seemed negligible now reveals itself to have untold depth. Above all, we cannot know what is to come – which is not a ‘weakness’ but a liberation. It opens up to possibility and is creative, not only of the future, as it unfolds, but of the present as we experience it – and even of the past as it is now unveiled to altered sight. Nothing is fixed; determinism is not determinable. Smolin again:

A world without time is a world with a fixed set of possibilities that cannot be transcended. If, on the other hand, time is real and everything is subject to it, then there is no fixed set of possibilities and no obstacle to the invention of genuinely novel ideas and solutions to problems. ²⁰⁴

In the absence of time, there can be no freedom, no evolution, no creation. Time is no tyrant, but the bringer of liberty.

The only surviving fragment of the pre-Socratic philosopher Anaximander, born in the seventh century BC, already notes that there is a first principle, or ground of Being, beyond definition and without bounds (*apeiron*), ‘out of which come into being the heavens and the worlds in them’; and that from this *apeiron*, ‘the things that are, come into being, and perish into the things out of which they come to be, according to necessity; for they give to each other justice and recompense for their injustice in conformity with the ordinance of time’.²⁰⁵ Here are already hints of important ideas: that time grounds existence, since whatever happens does so in conformity with its ordinance; that ‘the game is never over, birth and death are even’; that things arise not just from opposites, but from an element of *resistance*, which is bound up with time (compare Heraclitus’ ‘war is the father of all things’); and that the conflict nonetheless leads to resolution and reparation, in a never-ending flow.

Time’s never-ending quality also ensures that ‘the terms are not final’. Time is as much the creator as the destroyer: indeed ultimately more so, since what has been is never undone. ‘*Omnia mutantur*’, wrote Ovid in the *Metamorphoses*, ‘*nihil interit*’ – ‘all things change, but nothing perishes’. Aristotle quotes the poet Agathon’s lines that ‘One thing alone not even God can do, / To make undone whatever hath been done’.²⁰⁶ Even the process of apparent destruction is merely part of the flow of creation. The entire business of life, from the tiniest single-celled organism to the whole sweep of evolutionary history, is one of constant flow, in which what we call ‘things’ appear and disappear; and yet it is one of constant creation and novelty, a present in which both past and future are importantly implicit. There are echoes of Hegel’s image of the bud, blossom and fruit²⁰⁷ in Yeats’s poem, ‘Among Schoolchildren’, and they have a similar import:

O chestnut tree, great rooted blossomer,
Are you the leaf, the blossom or the bole?
O body swayed to music, O brightening glance,
How can we know the dancer from the dance?

So it is that, according to Hegel, the ‘equal necessity of all moments constitutes alone and thereby the life of the whole’.²⁰⁸ Each moment passes but no part of time is lost, each constituting part of the phenomenon as a whole. We do not regret the loss of each note of a melody as it is played: we do not regret the passing of each step in the dance. In the chapter of *The Principles of Psychology* which James devotes to the perception of time, he asserts that ‘the knowledge of some other part of the stream, past or future, near or remote, is always mixed in with our knowledge of the present thing’.²⁰⁹ So it is that each note of a melody is prepared by, and still contains the presence of, the notes that come before it, and prepares for and already contains an anticipatory experience of the notes that are to come. *If this were not the case, there would be no meaning whatsoever in the note at the instant it was heard.*

All is a flow, a pattern, in which each ‘part’ separated in time or space is implied in the whole – and therefore in the other ‘parts’. And that includes each one of us.

TIME IN MODERNITY

The search for immobility and for the cessation of time's flow coincided with what I see as the left hemisphere's entry into the philosophical ascendant after Plato. It should therefore be particularly marked in modernism: and as Louis Sass points out, that search reaches its apotheosis in modernism. In this regard, he cites the cultural historian Roger Shattuck, who points to the time-machine fantasy of the early Dadaist Alfred Jarry as a symbol of the consciousness of the modernist age.²¹⁰ The fantasy machine achieves absolute immobility by a constant spinning motion, turning on its own centre, so as to escape the bounds of time – a sort of process of self-involution without end.

At a much more mundane level, is it not the fantasy of modern man – and woman – to defy time? Puritan diets, punitive exercise regimes, hair transplants, plastic surgery, cryogenics? An embargo on serious conversation about the fact that we are all born to die – quite soon? And that the meaning of life lies in its quality, not its quantity? Time and death are, it seems, our constant sources of anxiety and fear.

The idea of time as a thing leads ineluctably to the idea of time as a *resource*. This is in perfect synchrony with the left hemisphere's take on the world. The advent of spatialised clock time means that time appears to be something composed of chunks that can be counted – seconds, minutes and hours – *things*. 'Remember that TIME is Money', are the first words of Benjamin Franklin's 'Advice to a Young Tradesman'.²¹¹ Hence time, like money, is 'stuff' that can be saved, wasted, or lost. As such it becomes something like money, merely a representation of something else that *is* real.

Lakoff and Johnson have done much to illuminate how the 'time as resource' metaphor changes our relationship with time. 'Cultures in which time is not conceptualised and institutionalised as a resource', they write, 'remind us that time in itself is not inherently resource-like. There are people in the world who live their lives without even the idea of budgeting time or worrying if they are wasting it.'²¹² They quote an article from the 1984 *San Francisco Chronicle* which showed that the average weekly 'time theft' per employee amounted to 4 hours and 22 minutes. Time theft was, so

the article claimed, America's 'number one crime' against business: the crime consisted in chatting with colleagues, dealing with personal matters in office time, extending lunch hours, and so forth.

Now we are all encouraged to see time as a resource, a thing, and therefore to rush our lives indiscriminately in order to pack 'more' into it. As a reaction to this there has arisen the Slow Movement, whose *raison d'être*, according to Norwegian philosopher Guttorm Fløistad, is that our most profound needs, those for closeness, care, love and appreciation of the good things in life, as well as of one another, depend on slowness in human relations: 'in order to master changes, we have to recover *slowness, reflection and togetherness*. There we will find real renewal.'²¹³ Pressure to acquire speeds things up; living in tune with the world moves things at the world's pace once again.

The urge to get more and more out of less and less time can reduce value overall: an apt example comes from scholarship. As Stefan Collini, who has written cogently about the plight of the modern university, puts it in his foreword to Berg & Seeber's *The Slow Professor: Challenging the Cult of Speed in the Academy*,

'Write more and publish less' is a valuable injunction, encouraging us to explore our thinking more, and only to publish when we are sure we have something worth saying ... we largely think by writing – or, rather, by trying to write and thus discovering that we don't quite know what we think. Similarly, rewriting is not chiefly a matter of buffing up already polished prose, but of coming to think a little more clearly and exactly. It all takes time.'²¹⁴

Economic pressures to do more faster may destroy quality and hence positively *waste* time.

Because we think of time as a 'thing' to be filled with other 'things' we foreground it (and of course spatialise it). We hasten always to pack more in, often seeking to do (but it cannot truly be done) as many things as we can at the same time. It leads us to feel we are always running against the clock, running after things and snatching them hastily, putting them in our little – always too little – bag of time.

Time, however, does not work like this. The more we hurry, the more it hurries, too. The more we try to do things at once, the less they mean, the less pleasurable they are, the less time we have, and the less we are alive. For we are never really *there*, but forever in the past or the future. Our mind is chasing another phantasm just as life offers us a potentially authentic experience: we munch it mindlessly, while watching TV, keeping an eye on our phone, half-listening to what our friends or children are saying, failing to notice what is happening under our noses and unable to see that there is a problem except – that there is not enough time.

This is not your fault or mine. It is the way we feel obliged by our culture to live – if life it still is. Running away from mortality, we speed its arrival.

Time, however, expands, slows, and feels rich and companionable when we stop and simply attend to where we are. I am writing these words in rural Greece, somewhere I have always found time and life unhurried, with immensely healing properties. It is early November, the time of the olive harvest: the days are still warm and filled with sunlight. But over the valleys there comes the constant whining and braying of engines: just as leaves are no longer raked or swept in Britain, but blown noisily, ineffectually and extravagantly from place to place by petrol-driven, back-strapped blowers, the olives are now shaken from the branches by the flailing arms of a sort of strimmer. This means that the local farmer's olives are now gathered in in one morning by a gang of eight men, each armed with a machine. In the past it would have taken the family, men, women and children, three days to do the same work. How wonderful is that?

Well, it depends what you think life is about. Picking olives with friends and family was a companionable event. It involved singing and laughter. It brought together communities across the generations. It was work, but not in truth terribly hard work when the labour is shared. It would be punctuated with pauses to sit, chat, eat and drink. It had a meaning which is difficult to convey, surrounding the relationship between the often ancient trees, a proper reverence for them, their harvest, and its place in Greek culture, the process of gathering in something in the nature of a gift, in the peace of the autumn landscape, that would be stored and enjoyed over the whole coming year. It is also true that the olives were more carefully harvested, and there was less detritus – branches, leaves, odd plastic attachments from the flails – that got into the mash. But it's more about

what it does to us and our relationship with nature than to the oil. A generative experience has been turned into a sort of violation: this was in fact the word used by the woman whose trees were being harvested in the village yesterday. Something the children would have remembered and hoped to repeat in their lives is gone. And so as to ‘create time’ – for what, exactly?

This is not a point about Greece, still less about olives; not even just country life – as it was before it was industrialised. It is a point about our attitude to time. The question always must be: what is our new way of doing things stopping us from experiencing (and how valuable or otherwise was that), and what are we doing with the time so ‘retrieved’ (and how valuable or otherwise is that)?

We have lost track of what seems, now, to us, like idleness: stillness, silence, peace, deep attention to what really matters. And this is quite compatible with work, if at the right pace. The title of one of the greatest ‘works’ of all Japanese literature, the *Tsurezuregusa* of Yoshida Kenkō, a fourteenth-century monk, translates into English as *Essays in Idleness*. One of its themes is a universal in Japanese and Chinese thought: the importance of transience to the meaning and beauty of all things.

It is only after the silk wrapper has frayed at top and bottom, and the mother-of-pearl has fallen from the roller, that a scroll looks beautiful ... If man were never to fade away like the dew of Adashino, never to vanish like the smoke over Toribeyama, but lingered on forever in this world, how things would lose their power to move us! The most precious thing in life is its uncertainty.²¹⁵

In its appreciation of whatever is irregular, unfinished to our hands, incomplete, always inevitably uncertain and ultimately transient, it both embodies much of the wisdom of the Orient, and singles out what it is that the right hemisphere alone can appreciate. To the left hemisphere these all seem like failings and fallings away from some illusory, timeless, perfection. How we strive, we in the West, to freeze the fleeting moment, to defy death and ageing, to make things regular and certain – deceiving ourselves, because none of these aims can be realised.

Two myths, one ancient and one modern, reveal that the ideal of permanence is a denial of everything we value. In the *Odyssey*, Homer

gives his hero the opportunity to become immortal by remaining forever the lover of the beautiful goddess Calypso: but Odysseus is restless, and misses his wife and home on Ithaca. After seven years he is freed to go back to the everyday human world, with the implication that he must grow old and die. And in Julian Barnes's *A History of the World in 10 ½ Chapters*, the last chapter deals wittily with the consequences of living in what should be eternal bliss: his nurse-guardian angel confides that eventually, and often after only a few hundred years, all the residents of Heaven ask to go back to die.

The Greek island of Icaria hit the news when someone noticed that its inhabitants regularly lived to be over 100 years old. A man born there, but living in the US, was given six months to live, and decided to return to Icaria to pass his last days among the people he knew and loved. That was 50 years ago, and in his 90s he is still cultivating his vegetables. What is the secret of the island life? When everything else was taken into account, the main things that stood out were the habit of rising late (the doctor's surgery didn't even open till 11 am), taking at least one good daytime nap, working for a few hours in the open air growing food, and drinking two-thirds of a litre of wine a day. My own suspicion is that genes played a part, too – but the prescription for a good life is so good, why spoil it?

The *ancient* Greeks had no great love of work, either. They saw it as a necessity whose purpose was to clothe, shelter and feed the population, but that once that was out of the way, they could get back to the real business of life: namely, leisure. By this they did not mean just lazily lying about, nor, as leisure often seems to be nowadays, the frenetic pursuit of stimulation in a desperate attempt to fill the void so that we do not have to contemplate the emptiness of existence. No, it was in a way the opposite. A cultivation of stillness, the devotion of time and attention to what matters, and that has no ulterior purpose or instrumental 'point' – and is therefore in grave danger, nowadays, of being considered 'pointless': scholarship (which comes from the Greek *scholē*, leisure), and the pursuit of insight, simplicity, beauty.²¹⁶ Leisure was the disposition of *receptive* openness to what *is*, all that we miss as we rush through life on our highway to the grave. In the German philosopher Josef Pieper's lectures, delivered just after the Second World War, and later published as *Leisure: the Basis of Culture*, he wrote: 'there can only be leisure, when man is at one with himself'.²¹⁷ We tend to overwork, he pointed out, as a means of self-escape, as a way of trying to

justify our existence. Busy-ness, he contended, was the true laziness, a failure to engage fully and responsibly with oneself and the world.

Incidentally, leisure comes from Latin *licēre*, to have the opportunity or permission to do something. The German word for leisure, the word in Pieper's original title, *Muße*, is related to the modern German *müssen*, equivalent to our 'must', in the sense of having an obligation to do something. Originally, however, *müssen* meant to have the opportunity, the space, the time, the *leisure*, to do something; only latterly did it acquire the sense of obligation.²¹⁸ English 'must' took a similar route from permission to obligation, though perhaps even earlier.

Historically the attitude that 'busy-ness' was both abnormal and regrettable was far commoner than our own view of work as a way of life. I had a teacher who in his 40s left to farm a smallholding of 30 acres in Wales: he and his family were largely self-sufficient, with their own sheep, ducks and hens, their own corn and vegetables. When I went to stay, I was astonished to find how much leisure time there was, since I had anticipated it would be grindingly hard work. We put in about two or three hours in the morning, milling corn by hand, scything grass, chopping wood, and had the rest of the day free to read, talk and go for walks. When I expressed my astonishment, he explained that there were two busy periods a year: a couple of weeks in the spring, during lambing, and a couple of weeks in the autumn, for harvest, when they and their neighbours all mucked in to help one another, and some of those days were very long. They were also associated with social gatherings across classes and generations, convivial festivals. Other than that there was no need for long hours. He recalled how William Langland berated the fourteenth-century peasantry, because of their soft lives, demanding long lunch breaks and refusing to eat bread made from unrefined flour. He explained that it was only with the eighteenth century that farming life became hard, and country people were expected to work punishingly long days: landowners had discovered greed, otherwise known as capitalism. They, and therefore all around them, were no longer content to produce just what was needed by the community, but to make the land yield more and more, to sell the excess and to become rich on the profits.²¹⁹ In this story, familiar to us today, there are some winners and many losers. And even the winners are, taking the broad view, losers, too.

'Faith in progress is deep within our culture', writes Juliet Schor. 'We have been taught to believe that our lives are better than those who came

before us.’ She rejects ‘the notion that we work less than mediaeval European peasants, however poor they may have been’. And she reflects that ‘the lives of so-called primitive peoples are commonly thought to be harsh – their existence dominated by the “incessant quest for food”. In fact, primitives do little work. By contemporary standards, we’d have to judge them extremely lazy.’ When we are asked to be thankful we no longer have to work as hard as our forebears, she says, the comparison

conjures up the dreary life of mediaeval peasants, toiling steadily from dawn to dusk. We are asked to imagine the journeyman artisan in a cold, damp garret, rising even before the sun, labouring by candlelight late into the night. These images are backward projections of modern work patterns. And they are false. Before capitalism, most people did not work very long hours at all. The tempo of life was slow, even leisurely; the pace of work relaxed. Our ancestors may not have been rich, but they had an abundance of leisure. When capitalism raised their incomes, it also took away their time.

The working day had long breaks for food, and for sleep, which were universally expected. The Church calendar contained many holidays and festivals: ‘all told, holiday leisure time in mediaeval England took up probably about one-third of the year. And the English were apparently working harder than their neighbours.’ There were long vacations at Christmas, Easter and midsummer. Apparently even the *ancien régime* in France guaranteed 180 days holiday a year (that is, including Sundays). It was only with the advent of capitalism, and especially industrialisation, that lives became miserably hard. ²²⁰ It is capitalism that generated true poverty.

The philosopher Jacques Ellul points out that the fact that

man until recently got along well enough without measuring time precisely is something we never even think about, and that we do not think about it shows to what a degree we have been affected by technique ... At most, life had been regulated since the fifth century by church bells; but this regulation really followed a psychological and biological tempo. The time man guided himself by

corresponded to nature's time; it was material and concrete. It became abstract (probably toward the end of the fourteenth century) when it was divided into hours, minutes and seconds ...²²¹

I mentioned that time becomes boring when we 'see' it in the left hemisphere sense – ie, fail to understand it. If we are readily bored, and quickly distracted by every sensation, what is our pathology?

It is known that people who are prone to boredom have little capacity to sustain attention,²²² and are also less accurate at judging the passage of time at multi-second intervals.²²³ Attention-deficit/hyperactivity disorder (ADHD) is a right hemisphere deficit condition: amongst many other associations, subjects incidentally exhibit, as in right hemisphere damage, left-sided neglect,²²⁴ and have thinning of the right frontal cortex.²²⁵ Those with ADHD show deficits in right hemisphere attention.²²⁶ Because the easily bored cannot sustain attention, they constantly make more errors, get less involved with the task, and find it takes longer to complete, creating a perfectly self-reinforcing circle; there is a clear two-way relationship between attention deficits and the experience of boredom.²²⁷

When we are bored, our attitude toward time is altered, as it is in some dreamlike states. Time seems endless, there is no distinction between past, present and future. There seems to be only an endless present.²²⁸

We are, it seems, back to the left hemisphere condition of time without meaning: interminable – timeless – time. And yet we have never lived under such time pressure as we live now. For we are no longer able to be at ease in its flow; we are forever trying to row upstream.

Modern culture reflects many of the characteristics of left hemisphere domination: loss of focus, of history and continuity, disrupted attention, excess of detail, fragmentation, reification, loss of the embodied self, and so on. But we are also losing a sense of the importance of narrative. Louis Sass, pointing to a seminal work of modernism, Joseph Frank's 'Spatial form in modern literature', sees modernism as denying time, preferring to dwell on descriptions of static objects rather than processes or actions.²²⁹

Modernist art also, intriguingly, made concerted attempts specifically to disrupt narrative.

And not just in art, but in life. With increasing mobility ensuring that the continuity of local histories is disrupted, and identity politics masterminding the complete rewriting of a people's history in a manner hitherto confined to totalitarian regimes, we are becoming a society without a history, in a novel without a narrative. And breakdown of narrative risks loss of meaning, coherence and purpose, in a people as much as in a person.

CONCLUSION

My aim in this chapter has been not to argue in the abstract about the nature of time, which might not be particularly fruitful, but to suggest that there is a lead on this from what we know about the brain hemispheres. On this account, brain science harmonises with reason, with intuition from experience, and with imagination. Together they enable us to achieve an insight into which of the competing views of time is most likely to prove viable, fruitful in the longer run – thus passing the pragmatist test for truth.

In the time debate, I suggest, we should prefer a view that time is real to one that it is an illusion. We should back those who believe that it is essentially flow and cannot be fragmented; that there are no points in time but only duration; that its nature is incompatible with determinism; that the future is open, not closed; and that time is fundamentally asymmetrical. Of course I am not a physicist, but my understanding of the physics, for what it is worth, is that this position is coherent from a standpoint taken by (at least some) physicists.

I have tried also to suggest in this chapter that though we think of time as a thing, it is a quality of the process of life. Time is the process of creation, in fact – nothing less; and the process of creation is time. This insight is not just in Bergson, but in St Augustine's pregnant observation that 'the world is not made *in* time, but *with* time.'²³⁰ Meister Eckhart saw creation not as something that *has happened*, but what *is happening*, at each moment. Time is not an unfortunate incidental finding about the universe that may be an illusion, but the condition of its existence, and at the core of everything we can know.

Even if it were an illusion, we couldn't know that without time. As Rilke wrote eloquently in the *Duino Elegies*:

Does Time, as it passes, really destroy?
It may rip the fortress from its rock; but can this heart, that
 belongs to God, be torn from Him by circumstance?
Are we as fearfully fragile
as fate would have us believe?
Can we ever be severed

from childhood's deep promise?

Ah, the knowledge of impermanence that haunts our days
is their very fragrance.

We in our striving think we should last forever, but could we
be used by the Divine if we were not ephemeral?^{[231](#)}

My question to you then is, how do you know that the world that passes
is inferior to an imagined world in which nothing passed?

FLOW AND MOVEMENT

The cause of coming-into-being of all things is the vortex.

—*Democritus*¹

Movement is reality itself.

—*Henri Bergson*²

I do not define ... motion, as being well known to all.

—*Isaac Newton*³

LET ME TELL YOU ABOUT THE CURIOUS AND EXTRAORDINARY CASE OF JASON Padgett. By his own account a down-to-earth, party-loving furniture salesman from Tacoma, Washington, he was brutally assaulted, in 2002, outside a nightclub in the early hours of the morning. Although he was concussed, scans at the time showed no obvious brain damage. But something remarkable revealed, nonetheless, a deep change in the functioning of his brain.⁴

From having no aptitude for, or interest in, geometry or mathematics, he suddenly developed a talent for abstract geometrical draughtsmanship which at first seemed to him to represent the meaning of π , and later to relate to equations such as $E = mc^2$ or $hf = mc^2$. He also developed

obsessive-compulsive symptoms, which are of course widespread in the population, but which he did not have previously. They play a prominent role in autism, however, and he now developed a highly focussed, narrow preoccupation with stereotyped and restricted interests, inflexibility of routine and a persistent preoccupation with parts of objects – all of which are also typical of autism. Taken together, all of these features characterise, as we know, the phenomenological world of the left hemisphere, which prefers narrow focus, is relatively ‘sticky’ or inflexible, prefers rule-following, and is engaged by parts or fragments. And indeed the brain damage, he was later discovered to have sustained, although bilateral, was more severe in the right hemisphere; he was told that ‘because of this there was a possibility my left was compensating’ by going into overdrive.⁵

In line with his reports, he was scanned while attempting to visualise mathematical formulae. During these attempts to visualise mathematical expressions geometrically, brain scans showed significant activity almost exclusively, unlike normal subjects, in the left hemisphere, especially in the parietal cortex. We would normally expect activation principally in the right lateral cortex: but for Padgett, ‘experience of complex geometrical images emerging from mathematical formulas is restricted to the left hemisphere’, according to the experimenters.⁶ And, by way of confirmation, disruption of the left parietal cortex interfered with his ability to see the world in this way.⁷ Half of the mathematical expressions shown to Padgett during the scans followed this pattern: the others failed to excite visual imagery altogether, one way or the other.

A note at this point. Although there has been a tendency to see this as a case of sudden, almost Einstein-like seeing into the heart of mathematical problems, this seems unlikely, and Jason himself does not make that claim. His actual maths skills remained fairly basic after the accident and he has, in his own words, ‘about gone back to school to learn traditional mathematics’ in the conventional fashion since.⁸ Although he was drawing complex geometric shapes, he didn’t initially see them as representing equations, and there is no evidence that they actually do. No physicist or mathematician to whom I have shown the drawings can see any connexion between the patterns and the mathematical formulae (eg, $hf = mc^2$) that often form their titles: and although Padgett & Seaberg refer to the formulae that *did not* induce imagery as ‘nonsense formulas’,⁹ Berit Brogaard, in the report of her scanning study of Jason in *Neurocase*, is careful not so to

describe them. Because it is not true. There is no single mathematical difference between the two lists, appended to Brogaard's study, of 15 formulae that induced imagery in Jason and 15 that failed to do so.¹⁰ A physicist, who saw him making the drawings, urged him to get conventional mathematical training. Tim Chartier, a maths professor at Davidson, when asked, said that the drawings were remarkable, but commented that one had to be careful when using the word 'genius' and that Jason needed the help of a trained mathematician.¹¹ This does not mean, then, that he has found a sudden genius for maths, but rather developed an unusually perfectionistic attraction to creating diagrams that are self-referring – and entirely composed of straight lines.

That this has little to do with maths is not surprising since the visuo-spatial imagery accompanying mathematical problem-solving is usually associated with the right hemisphere, not the left. Bear in mind the distinction between abstract processing or *manipulation* of data, which is in the left hemisphere, and the *understanding* of its referents in the right. In keeping with this, release phenomena in the left hemisphere often show a disinhibited production of forms, not necessarily accompanied by meanings: procedures become more important than their real-world significance. Thus, in the realm of language a phenomenon known as hypergraphia (compulsive writing), or hyperlalia (compulsive utterance), sometimes combined under the term logorrhoea (excessive language), may follow right hemisphere damage: lacking the constraint of the right hemisphere, a meaningless hypertrophy of language may result, with a compulsive production of words devoid of clear reference.¹² It may be that Jason's extraordinary, obsessional and painstaking drawings are a visual equivalent of this. The links that he makes to significant formulae are likely to be adventitious rather than essential.

In any case this looks like a release phenomenon, secondary to right hemisphere dysfunction, in which the left hemisphere's visual system has become overactive, and almost, if one can put it that way, *enriched*. After all, we have seen that an equivalent 'enrichment' of right hemisphere function sometimes accompanies damage to the left hemisphere, so why not the reverse? During scans, however, Jason's right hemisphere is not inactive, but *becomes inactive* when he conceives an equation as an image (the opposite of what one might expect in the normal subject). In Jason, then, here is someone whose visualisations, following trauma, seem to

conform to the left hemisphere take on reality. Quite *how* true this is, though, has to be seen, as they say, to be believed. Listen to what he reports.

When he regained consciousness after the assault,

things looked like individual picture frames coming in. And clouds moving – instead of looking smooth, they looked like little tangent lines in a spiral. Everything was discrete and chunky ... ‘Raindrops, to me, they’re these beautiful interference patterns’, he said. ‘They don’t look like they’re these smooth round ripples. They look like they’re little tangent lines. So, again, the smoothness is gone from everything. Trees moving would be like an equation translating. Like, if you were to write an equation, and it translates, it makes graphs change.’¹³

The next morning, while running water in the bathroom, he noticed

lines emanating out perpendicularly from the flow ... At first, I was startled, and worried for myself, but it was so beautiful that I just stood in my slippers and stared.¹⁴

And when he extended his hand out in front of him, it was like ‘watching a slow-motion film’, as if every slight movement was in ‘stop-motion animation’.¹⁵

Where have we seen something very like this before? Indeed, all these elements, so beautifully gathered together in one example, suggest the phenomenology of the left hemisphere, bits and pieces of which we have seen in patients with right hemisphere damage. Wholes have become parts, discrete, ‘chunky’. Elsewhere Jason describes everything he sees as having ‘a pixelated look’:¹⁶ the wholeness of things broken down into tiny discrete units. In his book he writes: ‘the house itself’, that most familiar of lived spaces, ‘seemed to fall away as a whole and become just a collection of shapes’.¹⁷ Flow and smoothness in time has become disrupted, so that motion becomes an indefinite number of individual ‘frames’, initially tending towards stasis, fragmented and slowed down. Later on, the disjunctive nature remained, but the speed normalised: he reported everyday vision as ‘discrete picture frames with a line connecting them, but

still at real speed',¹⁸ like a ciné film in which the frames are each distinct, not smoothed into flow. It was as if 'someone is pressing the pause button on a video very quickly'.¹⁹

Similarly flow and smoothness in space have become disrupted, now an indefinite number of little lines. Specifically, curved lines have become reduced to an indefinite number of rectilinear ones. This is a very important feature for Jason. He reports that he experiences smooth contours as small tangent, and secant, lines. He is 'obsessed with drawing complex geometrical images using only straight lines'.²⁰ He says: 'There's no such thing as a perfect circle', because he can always see the edges of a polygon, however many-sided, that approximates the circle.²¹

Remember Schelling's description of causative chains:

the individual successions of causes and effects (that deceive us with the illusion of a mechanism) disappear, being infinitely small straight lines in the universal curvature of the organism, in which the world itself runs continually onward.

Remember, too, Bergson's description of the logician: 'Having in fact left the curve of his thought, to follow straight along a tangent, he has become exterior to himself. He returns to himself when he gets back to intuition.'

As mentioned, Nicholas of Cusa thought that truth is not a thing like other things, or put together from other things, but indivisible. The image he used to describe the problem is that the intellect moves in straight lines, whereas reality is curved, and the curve of reality can never be reached however many straight lines you use.

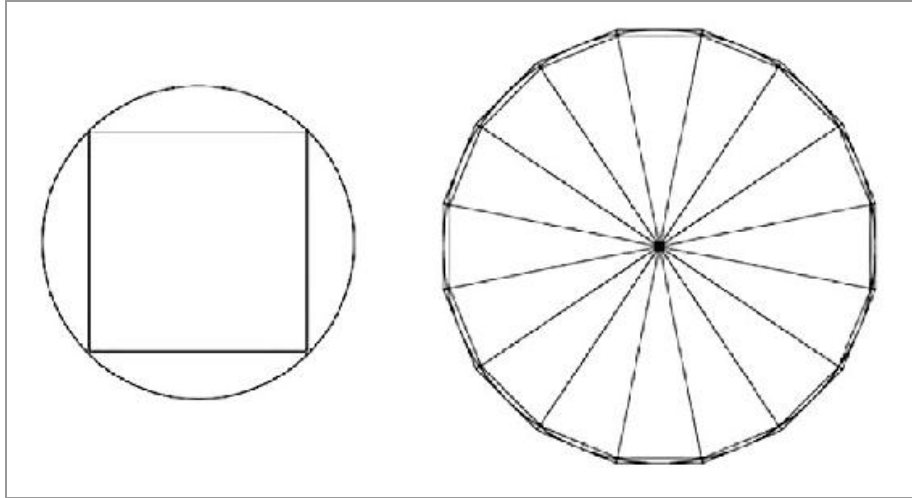


Fig. 37. Geometric illustrations of Cusanus' concept of truth: the circle represents truth, the polygon the intellect's never fulfilled approach to truth

Interestingly Cusanus wrote a treatise on the impossibility of squaring the circle, a mathematical fact that was not proven until 1882.

Though obviously stemming from a different period in intellectual history, Cusanus's view has its parallels in Schelling, Bergson and James, who all pointed to the importance of what they called intellectual intuition, rather than intellect *tout court*. The difference between straight lines and curves is not a simple geometric one, as Kepler expressed in a comment that should make us think. In his first work, the 1597 *Mysterium Cosmographicum*, he wrote, 'For this one fact, Nicholas of Cusa and others seem to me divine: that they attached so much importance to the difference between the Straight and the Curved.'²² (As Hundertwasser was to say: 'The straight line is the curse of our civilization.'²³)

Let's return to Jason. Fig. 38 shows a circle as Jason sees it, constructed from 360 triangles, a polyhedron that can never (he repeated it with 720 triangles) become a circle:

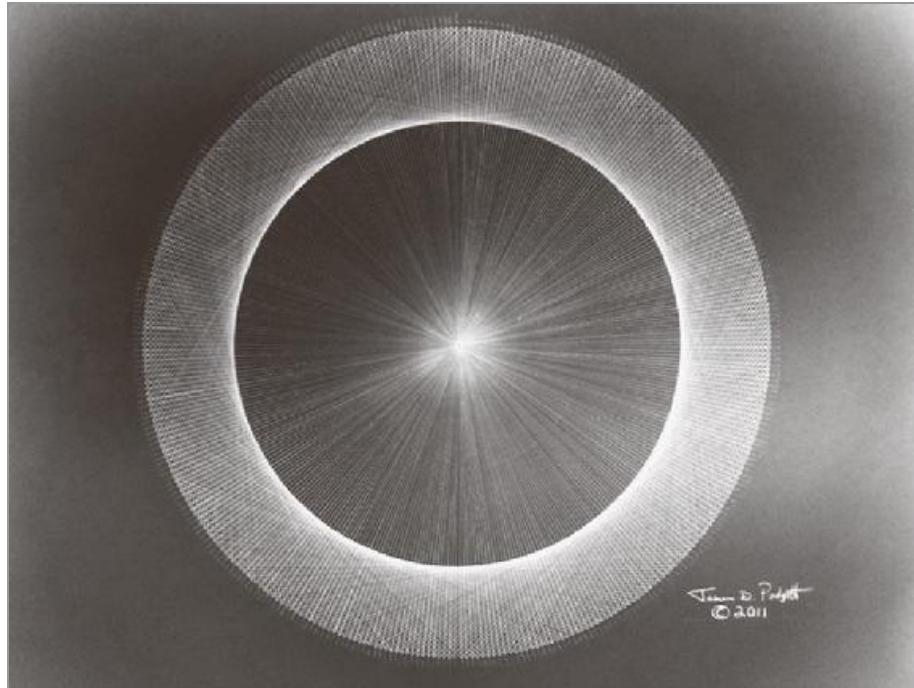


Fig. 38. Towards Pi 3.141552779, drawing by Jason Padgett, 2011

There was an immediate perceptual alteration following his injury, before he began his painstaking draughtsman-like diagrams. Here, from the early clinical setting, are his demonstrations of how he saw a circle (presumably this is a VW car wheel), approximated by tangents from the outside (with smaller inset instances of the same phenomenon); and an everyday object, a balloon, whose smooth contoured surface is broken up into numberless tangential straight lines (see Fig. 39).

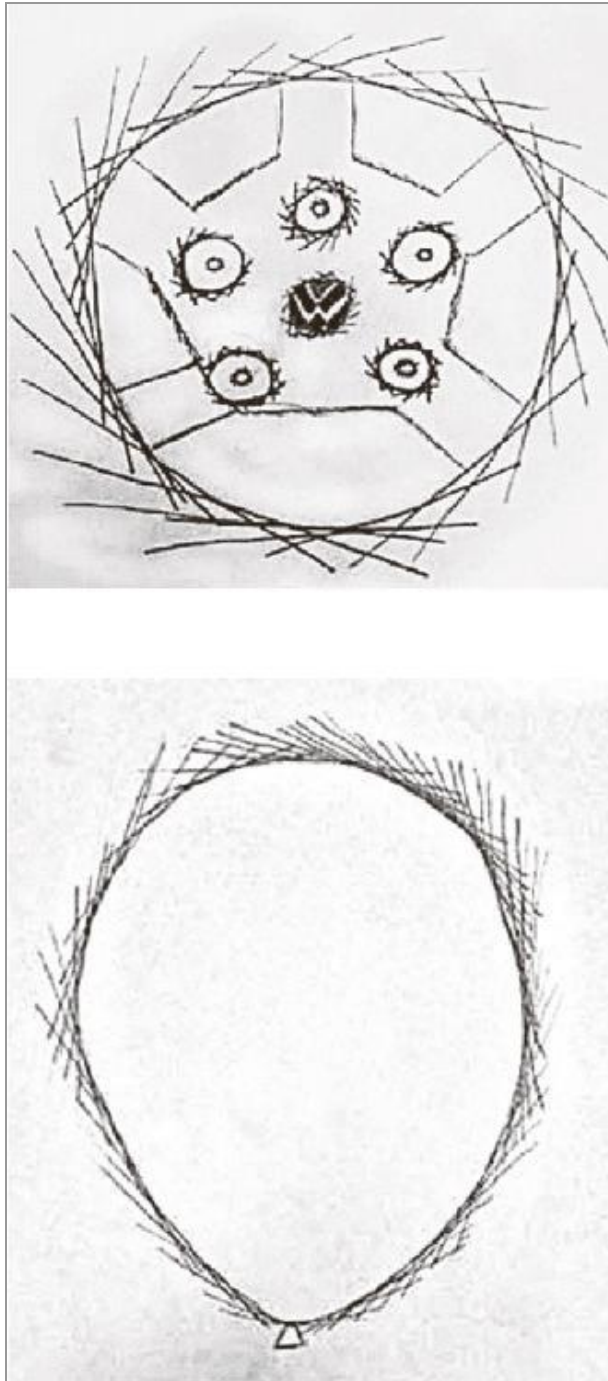


Fig. 39. Early post-traumatic drawings of car wheel and balloon, by Jason Padgett (from Brogaard et al 2013)

Five years before I read about Jason's accident, I described how:

something that does not come into being for the left hemisphere is re-presented by it in non-living, mechanical form, the closest approximation as it sees it, but always remaining on the other side of the gulf that separates the two worlds – like a series of tangents that approaches ever more closely to a circle without ever actually achieving it, a machine that approximates, however well, the human mind, yet has no consciousness, a Frankenstein's monster of body parts that never truly live ...²⁴

Living, embodied forms, such as a tree, have become for Jason certainly something new and beautiful, but essentially abstract and inanimate, 'like an equation translating'. 'Numbers are an obsession, and I'm incapable of turning the fixation off. I can't climb stairs without counting them'.²⁵

This might sound like typical OCD – and that is clearly an element – until one realises quite what he means by this. Everything in his world has not just latent (as is true for all of us), but appears to have *explicit*, abstract structure. The everyday, concrete and familiar has become something unusually abstract. Speaking of his morning coffee, he says: 'The perfect spiral is an important shape to me. It's a fractal. Suddenly, it's not just my morning cup of joe, it's geometry speaking to me.'²⁶ And: 'I see shapes and angles everywhere in real life', he says, 'from the geometry of a rainbow, to the fractals in water spiralling down a drain.'²⁷

'Water spiralling down a drain' ... This point is worth pausing on. Because the water going down a drain is the best possible demonstration of a moving, ever-changing, ever-evolving, indivisible motion: a vortex. It is never, except artificially, frozen into a coherent image; and it is a constantly self-reforming asymmetrical structure (Fig. 40). Here, however, is Jason's beautiful, but very unusual, depiction (entitled 'black hole') of 'the pattern of lines I see overlaid on water going down the drain in the shower or the sink' (Fig. 41):²⁸



Fig. 40. Vortex in water

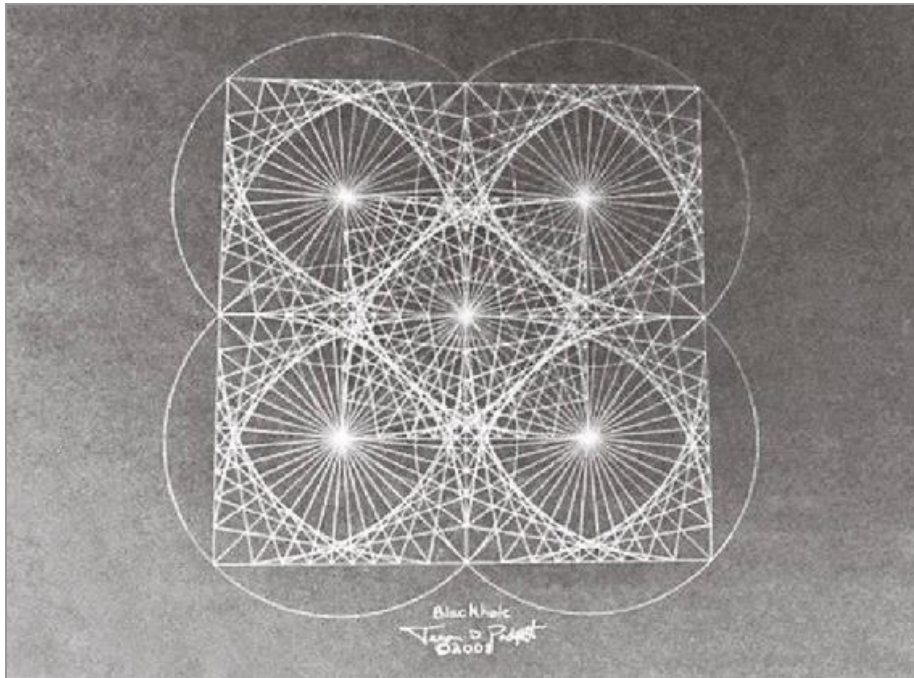


Fig. 41. Black hole, drawing by Jason Padgett, 2008

Here also is a ripple in water, as we would normally see it: not uniform, but containing an inner *tension between opposites*:



Fig. 42. Ripple in water

and here is a water ripple²⁹ as seen by Jason:

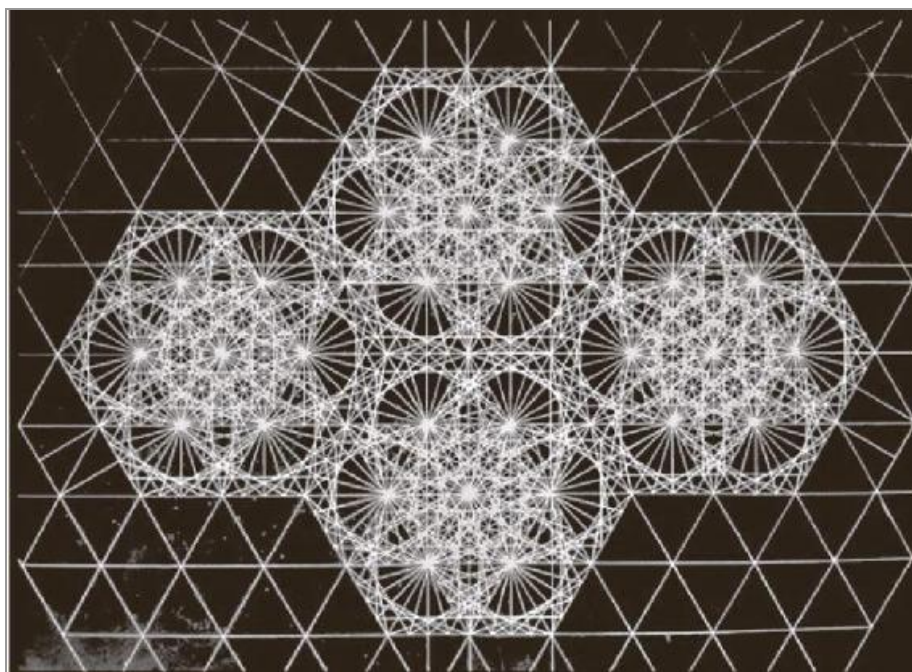


Fig. 43. Water ripple, drawing by Jason Padgett, c 2010

Static, symmetrical, intricate in detail, composed entirely of straight lines – and skilfully made. But a ripple? For most of us a ripple is quintessentially moving, constantly evolving, never symmetrical, a fluid whole containing nothing but curved lines, if lines at all. Remember that the first moment of astonishment for him was perceiving the flow of water in the bath to have straight lines emanating from it. For Jason, ‘water pours from the faucet in crystalline patterns’.³⁰ A beautiful word, crystalline, with its suggestion of stasis. Jason’s picture is a splendid, fascinating abstraction, residing in the realm of the left hemisphere.

Its fractal structure nods in the direction of infinity, but, according to his interviewer, ‘Padgett dislikes the concept of infinity, because he sees every shape as a finite construction of smaller and smaller units that approach what physicists refer to as the Planck length, thought to be the shortest measurable length.’³¹

But, as we have seen, neither extension in space nor time is actually comprehensible in terms of parts. A point is not a ‘dot’, because a dot already has a length, however short, and is therefore just a mini-line. A dot can’t account for the introduction of length into a line, because it already presupposes what it is brought in to account for. But if it has no breadth at all – which is what differentiates an ethereal *point* from a worldly *dot* – it is in no better position to account for it either. A point is not ‘part’ of a line, and a line is not an aggregate of points. A straight line, however short, is not part of a circle; and a circle is not an aggregate of tangents. We end up having to define a line and a point by saying what they are *not*: a line is what has length, but no width or depth; and a point is what has neither length, nor width, nor depth.

In a picture of Jason’s based on the so-called double slit experiment, he represents the ambivalence of his own work. In one world, the one alone he now perceives, there is no infinity, no flow, no wave, just finite, discrete shapes, composed of particles and straight lines, however complex; and yet at another level, there is also an awareness of the infinite, the flowing, the wave – hence the fascination for Jason and for us. Which of these two realities obtains may depend on which hemisphere is primarily attending to the phenomenon.

A few years ago I was asked to give the Vice-Chancellor’s Lecture at an English university, and, contrary to my usual practice, I had written out my talk. In it I had incautiously included this passage: ‘I sometimes think of the

right hemisphere as what enables Schrödinger's cat to remain on reprieve, and the left hemisphere as what makes it either alive or dead when you open the box. It collapses the infinite web of interconnected possibilities into a point-like certainty for the purposes of our interaction with the world.' When I arrived, I was greeted by the Vice-Chancellor, who turned out, to my deep unease, to be a physicist. I immediately started to have cold feet about what I had written, and made plans to omit the offending sentences. You can imagine my delight and surprise when he said, in so many words: 'I really enjoyed your book *The Master and his Emissary*. You know, I thought you could consider the right hemisphere as what enables Schrödinger's cat to remain on reprieve, and the left hemisphere as what makes it either alive or dead when you open the box. It collapses the infinite web of interconnected possibilities into a point-like certainty for the purposes of our interaction with the world.' So the passage remained ... Since then I have come across this from physicist and philosopher Ruth Kastner: 'I too have thought that right brain corresponds to quantumland possibilities and left brain to spacetime actuals.'³²

REALITY FLOWS, CONSCIOUSNESS FLOWS

James saw the entire universe as a seamless flow: ‘its members interdigitate with their next neighbours in manifold directions, and there are no clean cuts between them anywhere.’³³ And he saw consciousness as having the same structure. In a famous passage he described, in a phrase that has gone into the language, what he called ‘the stream of consciousness’:

Such words as ‘chain’ or ‘train’ do not describe it fitly as it presents itself in the first instance. It is nothing jointed; it flows. A ‘river’ or a ‘stream’ is the metaphor by which it is most naturally described. In talking of it hereafter, let us call it the stream of thought, of consciousness, or of subjective life.³⁴

This *coincidentia* of the structure of the universe with the structure of our awareness of it is of profound significance. Not only is it not a coincidence, in the everyday sense, but it is not even, I suggest, a case of one modelling itself on, through or by, the other. They are, I suggest, aspects of one phenomenon. But here I am anticipating the argument of a later chapter.

Let us return, then, to Heraclitus, whose saying that one cannot step into the same river twice is familiar. Its power depends on the fact that the river has permanence: we call it the same river, because it is. Heraclitus points not to change only, but as much to permanence: flow which ever changes but ever remains. There is no *succession of things* involved in this change, because they always flow, *interpenetrating* one another. One of Plato’s teachers, Cratylus, who was a pupil of Heraclitus, was right when he wittily added that we cannot step into the same river *once*, since at any instant it is already changing, and we too are in flux. And yet, like the river, it is only by changing that we can acquire the permanence we have.

Flow, then, is not primarily about change, since it is equally about persistence: I explored this coincidence of opposites in the chapter on the nature of the organism (Chapter 12), quoting Novalis. Consciousness flows, the body flows; given this, it is hardly surprising that the evolution of the self is such a flow, too. At least the right hemisphere sees that this is the

case: it is the right hemisphere, in particular the right dorsomedial prefrontal cortex (along with the right temporoparietal junction), that plays the critical role in sustaining the sense of a continuous self.³⁵ This is important because, in the left hemisphere's world, a self does not hang together. For Descartes, as we have seen, analysis reduced flow to a series of atomic points each devoid of any sustaining continuity with any other.³⁶ His radical doubt meant that he was sure of an existence at the 'now' point of his doubting (because *something* had to exist to be capable of doubt at all), but not of how he, René Descartes, should persist over time. I have also mentioned Derek Parfit, who, by following his distinctive analytic bent, concluded, remarkably enough, that persons have no continuous existence.³⁷

Bergson, however, by seizing reality, as he put it, 'from within, by intuition [RH] and not by simple analysis [LH]', found that the one secure reality was our 'own personality in its flowing through time – our self which endures.' And, as I mentioned in the last chapter, he compared it to music, an idea I will come to in due course.

So for both Bergson and James, the universe, consciousness, and the embodied self all flow. But there is a further point: change is accentuated when one sees '*things* that flow'; persistence when one sees the flow itself. And ultimately there is, they claim, just one incessant *flow*: though it may manifest as things flowing, the things arise on the surface of the flow, and do not constitute it. So why do we prioritise 'things'?

CONCEPTUAL THINKING DOES NOT FLOW

When we are absorbed in the natural business of living, our consciousness, as James says, forms a stream. He saw that in this stream

no element *there* cuts itself off from any other element, as concepts cut themselves from concepts. No part *there* is so small as not to be a place of conflux. No part there is not really *next* its neighbours; which means that there is literally nothing between; which means again that no part goes exactly so far and no farther; that no part absolutely excludes another, but that they compenetrates and are cohesive; that if you tear out one, its roots bring out more with them; that whatever is real is telescoped and diffused into other reals; that, in short, every minutest thing is already its hegelian 'own other', in the fullest sense of the term.³⁸

But when we inspect, focus on and therefore immobilise our conscious thought, the flow freezes. 'Concepts cut themselves from concepts': and according to Bergson, 'our concepts have been formed on the model of solids'.³⁹ (Concepts are in this respect, surprisingly, like *matter*.) They cannot interpenetrate; they are crystalline. This makes a kind of sense, because, Bergson continues, 'if the intellect [LH] has been made in order to utilise matter, its structure has no doubt been modelled upon that of matter'.⁴⁰ When it then attempts to grasp process, duration, the becoming of all that is, its very concepts externalise and freeze elements that are inseparable and dynamic in their essence. The flow is frustrated, being subjected to resistance. Equally James maintains that the very hard-and-fastness of categorical, conceptual thinking stops us seeing how things interpenetrate (its aim is to produce things that can be acted upon and manipulated, and therefore to *prevent* us from seeing it):

A concept means a *that-and-no-other*. Conceptually, time excludes space; motion and rest exclude each other; approach excludes contact; presence excludes absence; unity excludes plurality; independence excludes relativity; 'mine' excludes 'yours'; this

connexion excludes that connexion – and so on indefinitely; whereas in the real concrete sensible flux of life experiences compenetrates each other so that it is not easy to know just what is excluded and what not.^{[41](#)}

What I think perhaps both James and Bergson underestimate – understandably, because they are rightly and admirably engaged in pushing back against the fragmenting nature of left hemisphere thought – is the value of resistance in differentiating that flow. This resistance is provided by conceptual thought.

LANGUAGE AND THING-WORDS

The tool of conceptual thought is, of course, language. As Kierkegaard put it, ‘immediacy is reality and speech is ideality. Reality I cannot express in speech, for to indicate it I use ideality, which is a contradiction, an untruth.’⁴² As we saw in Part II, Eastern traditions prize silence and mistrust language. Their philosophic utterances are largely apophatic, drawing attention to what is *not* the case. Much Eastern thought deliberately disrupts conceptual and linguistic thinking, pointing to its limitations: for example, ‘the *tao* that can be named is not the real *tao*’. Such disruption could be seen as the whole aim of Zen, if having an overt aim were not in itself to subvert what Zen stands for. It brings to our awareness those things that must remain implicit if they are not to be denatured, that can never be clear when expressed in language, which is why Eastern thought so often seems to us what we call ‘paradoxical’. By contrast, the aim for clarity resolves complexities into simple generalities, and what cannot be reduced in this manner is charged with being obscure, says Bergson:

thus is explained the striking inferiority of the intuitive point of view in philosophical controversy ... Criticism of an intuitive philosophy is so easy and so certain to be well received that it will always tempt the beginner. Regret may come later ...⁴³

Regret often *does* come later, if one has not by then become so narrow and rigid that one cannot see what it is one can no longer see. And, it was for this reason, as we saw in Part II, that many philosophers have asserted that philosophy must ultimately give way to poetry, or to music, which transcend conceptual thinking and everyday language.

In using language we break up what is in reality inseparable, uncountable, immeasurable, into chunks: we substitute words for elements in experience, and these words, as Bergson puts it, ‘ever after will cover them up; we then attribute to them the fixity, the discontinuity, the generality of the words themselves.’⁴⁴ That is certainly the danger. For James, ‘events separated by years of time in a man’s life hang together unbrokenly by the intermediary events. Their *names*, to be sure, cut them

into separate conceptual entities, but no cuts existed in the continuum in which they originally came.’⁴⁵

The simple act of putting events into language can have a fixative effect. But dealing in names, thing-words, changes further our perception of reality. Although nouns are not always ‘object’ words, and may denote actions, there is no doubt that some of the vitality is sucked out of language when we take the substitution of nouns for verbs too far. Contemporary Western language, in keeping with the left hemisphere bias of the culture, tends to ‘nominalise’ verbs. When we talk about an event, writes the philosopher Peter Simons,

we typically nominalize a verb and form a derivative noun or noun-phrase: John’s snoring last night, Luciano’s rendering of ‘Nessun dorma’ in Madison Square Garden in 1987, Vesuvius’s eruption in 79 A.D. all designate occurrents [events]. We are extremely adept at coining and using such nominalizations in both impromptu and routine ways.⁴⁶

And we all recognise the tendency for bureaucratic and scientific prose to exploit nouns, especially abstract nouns, in place of verbs. In informal speech, we have now become so fond of nouns that we reach for them, in an unattractive trend, in place of verbs: to ‘action’ something, to ‘inbox’ someone, to ‘architect’ a plan, to ‘dialogue’, and so on – giving rise to the witticism that verbing weirds language.

Chinese relies more on verb forms than does English; in a language such as Navajo, nouns are not necessary to a sentence and most information is expressed in verb forms. That both conceptual thought and language return us to the vision of reality as made up of bits, and thing-words then instantiate it, helps explain the one-sidedness of much Western philosophy and its historical lack of cogent defences of a right hemisphere understanding of the world, which for all the reasons we have already discussed, I hold to be truer to what is. ‘Is it not possible for the syntax and grammatical form of language to be changed’, mused David Bohm, ‘so as to give a basic role to the verb rather than to the noun?’⁴⁷

NECESSARY RESISTANCE

Yet, for all this, conceptual thinking is part of the evolution of self-conscious awareness. While it is certainly, and importantly, true, as James says, that ‘when you have broken the reality into concepts you never can reconstruct it in its wholeness’, fortunately we do not have to; unless, of course, we fall under the spell of language and abstract concepts to such an extent that we are no longer able to experience the intuitive wholeness from which, as secondary products, those concepts, and the things they denote, derive.⁴⁸

That is a very substantial caveat in the world in which we now live. In some kinds of philosophical tradition this inability any longer to experience the intuitive wholeness is exactly what happens; and it so often happens nowadays that we need to be constantly alert to its effects, sceptical of it and on guard against its capacity to distort. The conceptual style of thought, James says, is simply

superimposed for practical ends only, in order to let us jump about over life instead of wading through it; and if it cannot even pretend to reveal anything of what life’s inner nature is or ought to be ... we can turn a deaf ear to its accusations ... We are so subject to the philosophic tradition which treats *logos* or discursive thought generally as the sole avenue to truth, that to fall back on raw unverballed life as more of a revealer, and to think of concepts as the merely practical things which Bergson calls them, comes very hard.⁴⁹

James mentioned a Hegelian other; and the thought takes us back to the need for something other than pure continuity and unity. There must be otherness, too, in some form within the flow. So it is that the very first passage I quoted from James above, the one about there being ‘no clean cuts’, begins ‘*without being one throughout*, such a universe is continuous’. That is the important point. ‘Its members interdigitate with their next neighbours ...’⁵⁰ So, note, there are still ‘members’, according to this account, even if they interdigitate. James rides the twin steeds of unity and

multiplicity at once. And so do we all. It was James's life's work to enable us to see this more clearly, more beautifully, than Hegel, or any other philosopher, had ever done, or has done since.

In one of his essays, D.H. Lawrence reflected:

What is it that man sees, when he looks at a horse? – what is it that will never be put into words? For a man who sees, sees not as a camera does when it takes a snapshot, not even as a cinema-camera, taking its succession of instantaneous snaps; but in a curious rolling flood of vision, in which the image itself seethes and rolls; and only the mind *picks out* certain factors which shall *represent* the image seen.⁵¹

Lawrence describes here perfectly the contrast between the seamless presence of experiential flow to the right hemisphere, and its representation in the left hemisphere; an inanimating takeover of the right hemisphere's animacy. Yet this left hemisphere intervention is not wholly misplaced. Indeed, it plays a crucial role in a certain kind of approach to reality if only by providing resistance. For, while there may well be a stream of consciousness, one aspect of consciousness, namely conceptual thought, as James realised, is not part of that flow. What he may have overlooked is that, to continue the metaphor, it provides rocks and stones in the stream: resistance to flow. That is its distinctive property. And for anything to 'arise' – rise up – tend, grow, change – there needs to be a degree of architectonic resistance within the connective flow. In this the right hemisphere and left hemisphere are, as ever, complementary. And this architectonic resistance, causing something to endure for a while, manifests in mind as conceptual thought – much as, I shall later argue, it manifests in space as matter.

CONTINUITY AND DISCONTINUITY TOGETHER

We need, then, continuity and discontinuity together – to ride the *twin* steeds.⁵² Here I would like once more to turn to Schelling, and his image of a stream, which is even more subtle and imaginative than the streams imagined by James or Bergson:

Think of a stream, which is itself pure identity. Where it meets resistance, it forms an eddy. This eddy has no permanence, but is constantly disappearing and reappearing. Originally nothing in Nature is differentiated; all that she produces is at that point unseen and dissolved in the general productive potential. Only when there are points of resistance are Nature's products gradually precipitated out, emerging from the general identity. At every such point, the flow is broken up (so that productivity is destroyed), but at each moment the swell renews, and fills the sphere afresh.⁵³

Resistance, according to Schelling, is *not a separate force*, but comes from the flow itself, and enables the unfolding of what in it is always potentially there; it precipitates the collapsing of its own potential into the actual. He is very clear that this resistance is part of the very same creative force that the resistance is there to resist. This is like the *coincidentia oppositorum*: some element of 'otherness' is incorporated within the force itself. All creation, he urges, is the result of this coincidence:

A stream flows in a straight line forward as long as it encounters no resistance. Where there is resistance – a whirlpool forms. Every original product of nature is such a whirlpool, every organism. The whirlpool is not something immobilized, it is rather something constantly transforming – but reproduced anew at each moment. Thus no product in nature is *fixed*, but it is reproduced at each instant through the force of nature entire ... Nature as a whole co-operates in every product.⁵⁴

The oneness is in the many-ness, and the many-ness in the oneness. ‘This whole construction’, he writes of the cosmos, ‘therefore begins with ... a *dissonance*, and *must* begin this way.’⁵⁵ Dissonance is not external, in some sense, to the music, but itself part of the music. I will consider the analogy of flow with music shortly.

What he calls the ‘products’ of Nature – the fruits of Nature’s generative quality, wherein its very essence lies – are never wholly distinct in themselves from Nature or from one another. They are only superficially ‘thing-like’. Hence the comparison to eddies in a stream, which, although constantly inconstant, flowing on and yet renewing themselves, preserve for a while an identity distinguishable from the overall flow, but not separate from it, an identity which arises from the *very resistance which the water encounters within itself*.

For Schelling, then, ‘things’ did not have the meaning they have for us. They were more like processes, elements brought forth from Nature, but themselves, in turn, giving further process to Nature. He complained that, from our customary point of view, the primordial productivity of Nature disappears in the product: for the philosopher, he warns, the product must disappear in the productivity.⁵⁶

What is more Schelling sees the very act of philosophising, which is nothing less than seeing into the nature of the world, as itself a liberating, creative act of Nature on behalf of Nature:

To philosophise about Nature means to raise her up from the dead mechanism in which she seems to lie imprisoned, and, in freeing her, to bring her back to life, so to speak, and restore to her her own free unfolding – it means, in other words, to tear *oneself* away from the common view, which sees in Nature only whatever happens to be – at best sees her activity merely as a *fact*, not the *activity* in itself.⁵⁷

This is an account of philosophy reanimating the dead structure as perceived by the left hemisphere by attempting to regain the living process perceived by the right: what philosophy should be doing, as Schelling believes (and as do I), rather than the reverse process which it often serves in Anglo-American analytic philosophy, turning the living process into a

dead structure. It is easy enough – indeed it happens automatically, and unconsciously, for us now – to see the mechanism and the parts; what is hard, without re-training one's attention, is to get back to seeing the living whole. To bring the corpse back to life.

Schelling held that there was a primordial energy, which he sometimes referred to as *Weltseele* ('world-soul'), which, like the stream, flows through the cosmos unimpeded until it encounters a difference within itself, a point of resistance. Then something is precipitated out of Nature, like the eddy in the current, a vortex. This 'product' of Nature is nothing mechanical or inert: it flows with vital energy itself, constantly renewing itself through the flow, which is both its cause and its effect, derived from this vital force's internal resistance. It is like a distinguishable pattern within the flow, precipitated out of the flow by the resistance in the flow. For Schelling, Nature continually evolves, due to the resistance that it carries within itself:

Nature is originally pure identity – nothing to be distinguished in it. Now, points of inhibition appear, against which, as limitations to its productivity, nature constantly struggles. While it struggles against them, however, it fills this sphere again with its productivity.⁵⁸

He also at times expressed the nature of being as a balance of contrary tendencies, a contractive force, 'gravity', and an expansive force, 'light'. All dynamic processes, he believed, could be seen as the interaction of these *contrary, but ultimately inseparable*, forces: a *coincidentia oppositorum*. This point is essential. For there to be a world at all, according to Schelling, the forces have to be part of one and the same process, otherwise either contraction would come to dominate, so that there would be no manifest universe, or else expansion would come to dominate, causing the universe to fly apart and dissipate at infinite speed. The final result would be the same in either case: there would simply be no world.⁵⁹ Only their being coextensive parts of one and the same process can guarantee their continual co-existence. A model for this is, once more, a magnet, whose opposing poles are inseparable from each other, even though they are opposites.⁶⁰

This equilibrium of flow with resistance, of expansion with contraction, according to Schelling underwrites the continuing process of Nature as a whole:

Visible Nature, in particular and as a whole, is an allegory of this perpetually advancing and retreating movement. The tree, for example, constantly drives from the root to the fruit, and when it has arrived at the pinnacle, it again sheds everything and retreats to the state of fruitlessness, and makes itself back into a root, only in order again to ascend. The entire activity of plants concerns the production of seed, only in order again to start over from the beginning and through a new developmental process to produce again only seed and to begin again. Yet all of visible nature appears unable to attain settledness and seems to transmute tirelessly in a similar circle.^{[61](#)}

RESISTANCE BRINGS TO BIRTH BEAUTY AND COMPLEXITY

It is worth making a brief diversion at this point to take a look at resistance to flow and just how creative it is in its very nature. No obstruction in the path of a flow is required for it to become turbulent; *any inequality in speed or viscosity within the flow itself* can lead to turbulence. However in cases where there is a solid obstruction, the resulting flow exhibits surprising new qualities. From a straight flow in a rigid linear channel meeting a simple, smooth straight-edged obstruction such as a rod placed at right angles to the flow, the most extraordinary richness of design can emerge. It is an unfolding of potential that is completely unforeseen, until it manifests itself as eddies, as beautiful and strange as a plant emerging from a seed. It is the perfect image of multiplicity emerging from unity through resistance.

The following images (Figures 44–50) are all taken from laboratory experiments in which a simple flow was interrupted by a single, straight-edged, regular obstruction of some kind. The pattern of flow was made visible by pulses along a very thin platinum wire in the water, causing the release of tiny bubbles into the flow, which show up as white lines on a photographic plate.

The first image shows vortices in a water stream in the wake of a rod of circular cross section placed perpendicular to the stream:

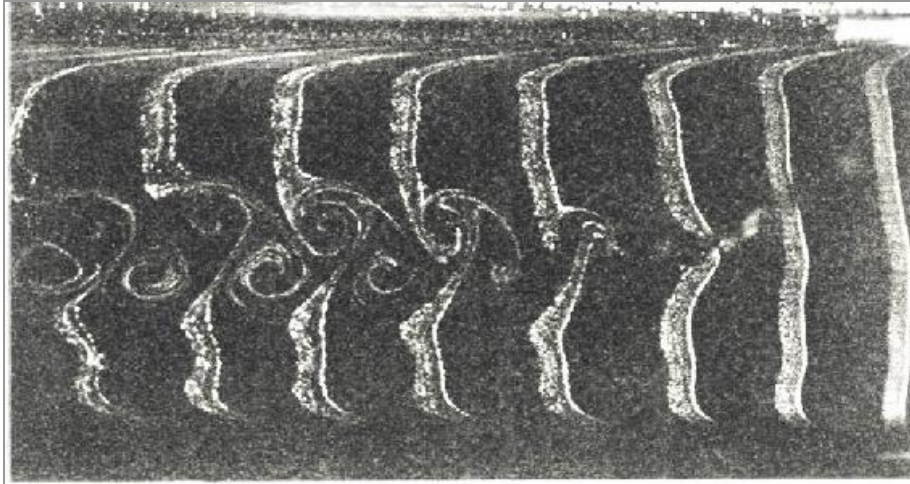


Fig. 44. Vortices in a stream caused by uniform perpendicular obstruction (Figures 44–50 all from Douthat, Nagib & Fejer 1975)

Below it is a detail from the above, which makes the resulting pattern more apparent:

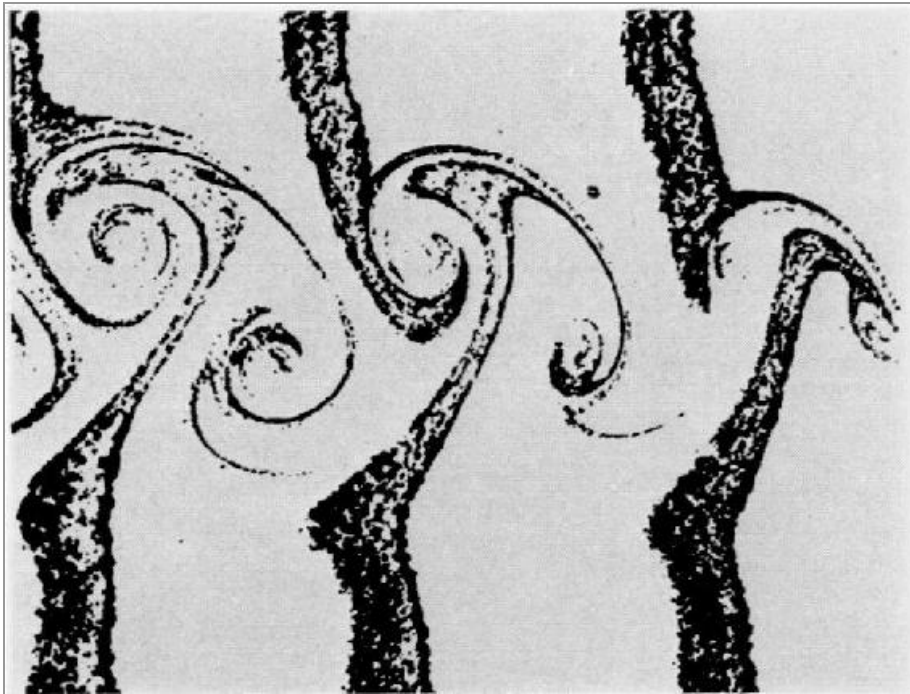


Fig. 45. Detail of above

The images that follow show an identical set-up: the vortices in a water stream in the wake of a rod of circular cross section placed perpendicular to the stream. However, different pulse rates and different durations have been employed in generating hydrogen bubbles. Each image has been reflected about the rod so as to incorporate a mirror reversal:

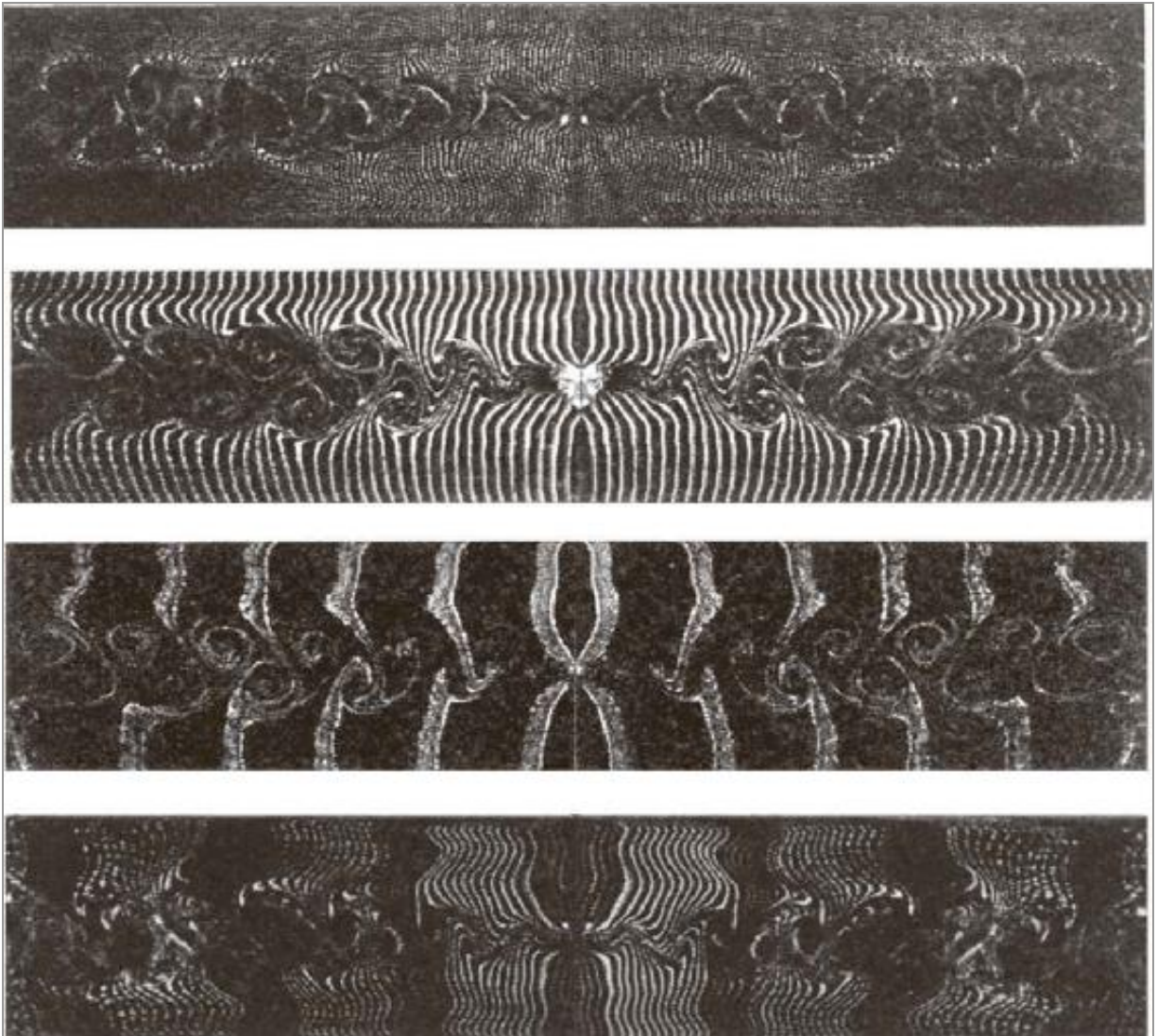


Fig. 46. Effects of differing rates and duration of pulse on vortices in stream

The images below are created by vortices in a water stream in the wake of a regular row or rake of rods of rectangular cross section:

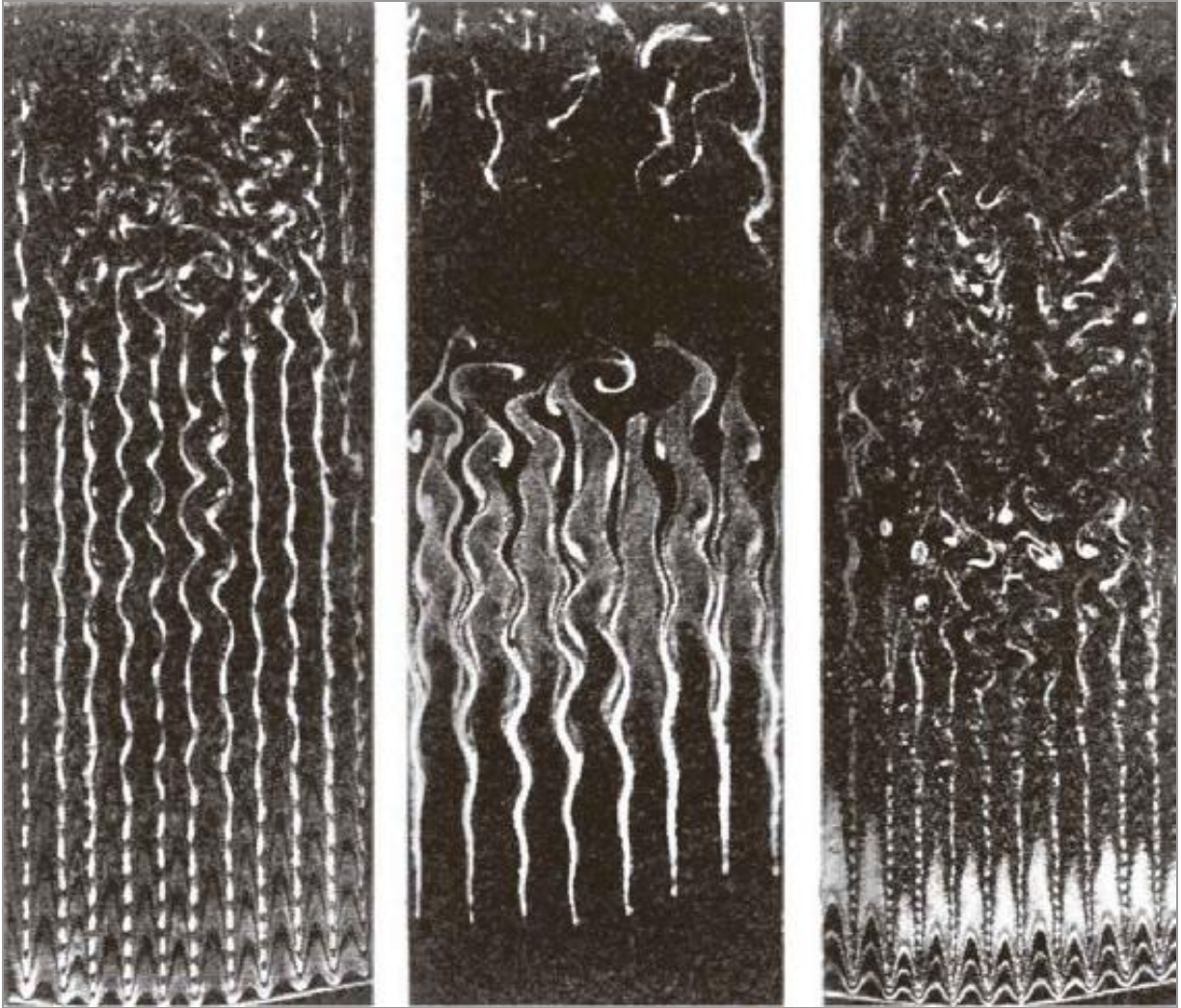


Fig. 47. Vortices in a stream in the wake of a regular rake of rods of rectangular cross section

The below image is a detail from this series:

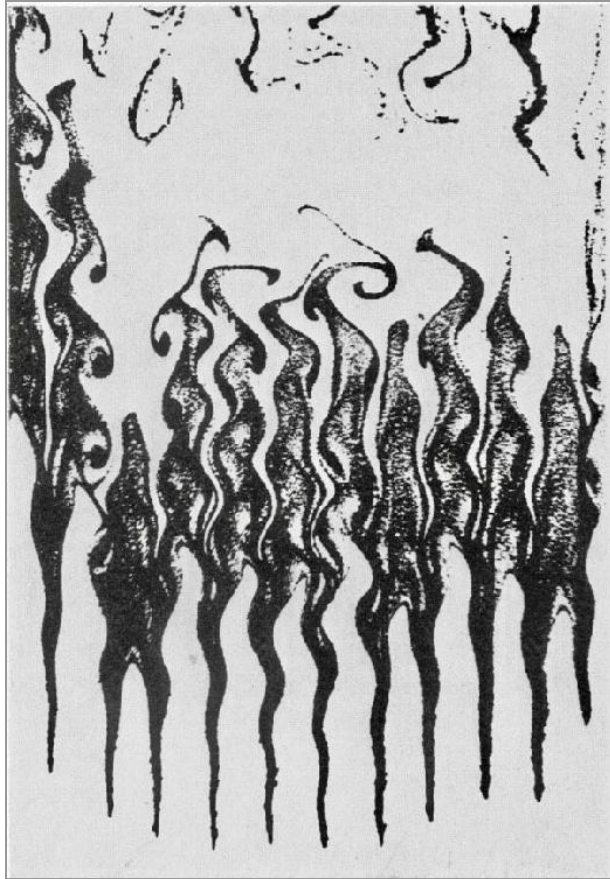


Fig. 48. Detail of above

The next image shows vortices formed when a stream of air impinges on a regular cube:

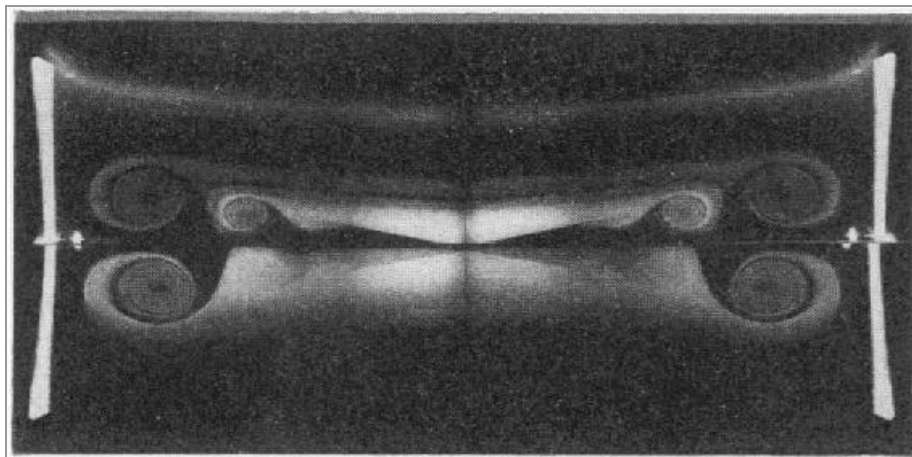


Fig. 49. Vortices formed when a stream of air impinges on a cube

And finally Fig. 50 shows the turbulence created behind a stick partially immersed in water. This kind of pattern, also seen in the first photographs above, is known as a Kármán vortex street.⁶²



Fig. 50. Kármán vortex street

Leonardo da Vinci was fascinated all his life by water, its appearance and behaviour. He closely observed, in particular, whirlpools, vortices, turbulence and other complex flow phenomena. In fact he observed precisely the flow of water round an old man's stick partially immersed in a shallow stream (Plate 19[a]).

Leonardo observed that water often behaved like hair, something that is apparent from his detailed drawings in Plate 18: 'Consider the movement of the surface of water. It behaves like hair, which has two motions: one conforms to the weight of the mane, the others to the wandering of the locks. Likewise water has its eddying movements, one part of which follows the principal current, the other the random and reverse motion.'⁶³

In another drawing, he observes the turbulence caused by a jet of water emptying from a rectangular opening straight into a pool, and at the same time the flow of hair (Plate 18),

Leonardo's late drawings of storms and deluges take things to the level where predictable patterns break down – as they do somewhat abruptly when turbulence passes a certain point.

That this degree of turbulence both has a life of its own and overwhelms human attempts to predict it is emphasised by the tiny village depicted near the foot of the drawing, caught up in the cataclysm (Plate 19[b]).

A close observer of the human body, Leonardo even understood the importance of vortices in the sinuses of Valsalva, at the root of the aorta, and their role in making possible the rhythmic opening and closing of the aortic valve, an observation that was confirmed only in the twenty-first century using 4-D MRI.⁶⁴ Indeed spiral form is intrinsic to nature, as we have seen, and it is the spiral orientation of musculature in the heart and vessels which makes circulation – and therefore much of life – possible.⁶⁵

THE CREATIVE POWER OF TURBULENCE

Turbulence is indeed a fascinating phenomenon. Vortices are absolutely fundamental in the structure of Nature, and almost all fluid flows occurring in nature, including all living organisms, are turbulent.⁶⁶ Turbulence is an expression of, and a consequence of, sustained energy flow, without which the vortex dies. As the mathematician Alexandre Borovik writes,

The turbulent flow of a liquid consists of vortices; the flow in every vortex is made of smaller vortices, all the way down the scale to the point when the viscosity of the fluid turns the kinetic energy of motion into heat. If there is no influx of energy (like the wind whipping up a storm in Hokusai's woodcut), the energy of the motion will eventually dissipate and the water will stand still.⁶⁷

For Hokusai's *Great Wave*, see Plate 20.

Turbulence is of unsurpassed complexity. According to the classic work on the subject, 'the mathematics of nonlinear partial differential equations has not been developed to a point where general solutions can be given. Randomness and nonlinearity combine to make the equations of turbulence nearly intractable.'⁶⁸ As a nice expression of quite how mind-boggling turbulence can be, Sir Horace Lamb, who had spent his life studying turbulent flows, quipped, in an address to the British Society for the Advancement of Science in 1932:

I am an old man now, and when I die and go to heaven there are two matters on which I hope for enlightenment. One is quantum electrodynamics and the other is the turbulent motion of fluids. About the former I am rather optimistic.⁶⁹

Richard Feynman described turbulence as the most important unsolved problem of classical physics.⁷⁰

A tornado is a typical vortex: it contains contrary motions, cold air pushing down on the outside and hot air spiralling up on the inside. Vortices

of all kinds both arise from and perpetuate such contrary motions. Most of us are not aware of how ubiquitous the vortex phenomenon is in nature. For example, it may account for how fish such as salmon and trout are able to rise up powerful columns of water that are pushing downwards, since the vortex has a core that moves as powerfully upward. (If a tornado can lift a house, a water current can lift a trout.) And they account for more 'everyday' phenomena, such as how fish are able to remain motionless in a flowing stream, without apparently consuming energy: they utilise the effect of vortices in the stream, often created behind rocks or stones, acting on their streamlined bodies. Even a dead trout can be shown to move passively upstream against the flow using such turbulence.⁷¹ If none is present, fish will also create vortices themselves, using their gills and movement of the whole body. Vortices account for how many aquatic animals move: 'animals swimming in isolation and in groups are known to extract energy from the vortices in environmental flows, significantly reducing muscle activity required for locomotion.'⁷² Vortices explain how swifts and butterflies fly, how basilisk lizards walk on water, and how the jellyfish comes to be the world's most efficient swimmer, using vortices to travel huge distances for the least possible expense of energy.⁷³

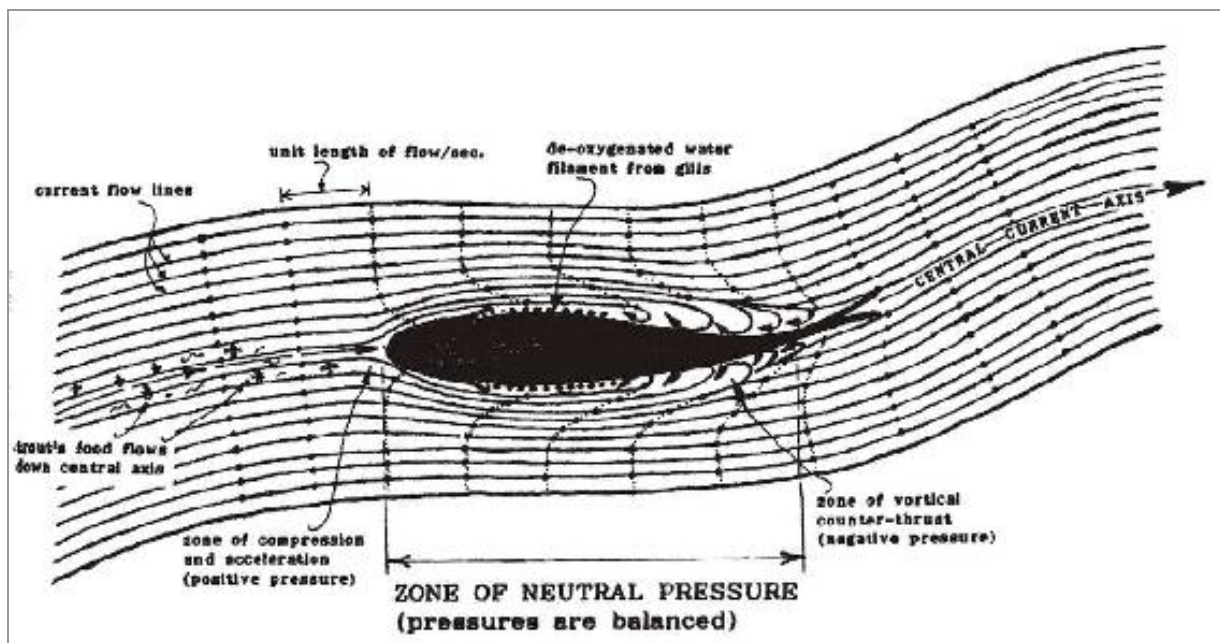


Fig. 51. Vortices and contrary motion (Coats 2001, based on the researches of Viktor Schauberger)

Turbulence, then, has a number of familiar qualities that are suggestive of its creative potential, and I would say, perhaps not coincidentally, of its conformity to the metaphysics of the right hemisphere. First, all turbulent flows are irregular and therefore largely unpredictable; and yet not lawless, even if we cannot solve the equations. Second, every turbulent flow is different from every other, even though all turbulent flows have many characteristics in common; in this they represent multiplicity in unity and unity in multiplicity. Third, turbulence is a continuum phenomenon. Fourth, it is three-dimensional (two-dimensional flows are not generally turbulent). Fifth, it involves circular motion: it is rotational. Sixth, its characteristics depend on its environment: they are highly context-sensitive. Seventh, it exists in and as the transfer of energy. Further, one could say it produces a paradoxical union of opposites. And, most relevant of all, just as turbulence is not physically linear, it is not metaphysically linear: it is not only the *result* of resistance of flow, it is the *source* of resistance of flow, all the while itself *being* the flow.⁷⁴

‘WE ARE SIMPLY MORE ADVANCED WHIRLPOOLS’

Let us return with that hint to Schelling. He says that although we may want to start from imagining an infinite number of ‘points of inhibition’ in Nature, ‘perhaps there is only *one* point of inhibition from which the whole of Nature develops itself’.⁷⁵ This one element of resistance is enough to bring into being the multiplicity of ‘things’. I like this, because it seems to me that the element of resistance exists first at the level of there being a unity, and only becomes manifold points as the unity is diversified into multiplicity. It reflects that very fact.

This has implications for the relationship between Nature and the individual consciousness (Schelling assumes human consciousness, but the argument could be enlarged in view of the findings of contemporary science, to the consciousness of other beings). In Schelling’s view each distinct consciousness arises as a vortex within an endless flow, an eddy in the stream. Compared with other aspects of, or ‘products’ of, Nature, ‘we are simply more advanced whirlpools, more clearly articulated expressions of the absolute.’⁷⁶ For Schelling, the emergence of thinking subjects from nature is part of a process whereby an absolute subjective consciousness comes to know itself. The process of consciousness is creative not just of what it comes to know but of itself, which are ultimately one and the same thing: ‘What in us *knows*’, says Schelling, ‘is the same as what *is known*.’⁷⁷ As I suggested in the first chapter, creativity is always self-creation as well as other-creation. This self-and-other-creation, according to Schelling, is the business of the cosmos.

To summarise, one could say that, in Schelling’s view, (1) there are no static things, only processes; that (2) there is an intrinsic otherness within unity, that is not separate from unity, but gives rise, by virtue of its resistance, to the multiplicity of phenomena; that (3) these phenomena, the ‘products of Nature’, are also processes, not things, and are not in any sense separate from Nature – rather an unfolding of the potential in Nature; and that (4) their being precipitated out of the primordial energy is the very process of creation. From my reading of him, this potential cannot be of Bergson’s first kind, where it is all prefigured, like the painting on the lady’s fan, just waiting to be revealed: it is of his second kind, where even

the *Weltseele*, the world-soul, itself does not know what is to come, since it gets to know itself only *through* the process of creation whereby simultaneously it and the world come into being together – not again as two distinct events just happening to happen simultaneously, but simultaneous because we are seeing *one and the same* process, just from two different standpoints.

Let's now turn briefly to look at the nature of the two great exemplars of flow – music and water – and, through them, at what in Chinese is discovered everywhere in the cosmos, the principle of flow known as *li*.

MUSIC AND PHILOSOPHY

Music is extraordinary and unaccountable. Of music, the philosopher Josef Pieper wrote:

Not only is music one of the most amazing and mysterious phenomena of all the world's *miranda*, the things that make us wonder (and, therefore, the formal subject of any philosopher...). Not only has it even been said, and rightly so, that music may be nothing but a secret philosophising of the soul ... yet, with the soul entirely oblivious that philosophy, in fact, is happening here ... Beyond that, and above all, music prompts the philosopher's continued interest because it is by its nature so *close to the fundamentals of human existence*.⁷⁸

Music speaks 'of the essence' of life, where the other arts 'speak only of the shadow', thought Schopenhauer.⁷⁹ Nietzsche went so far as to say that 'without music life would be a mistake.' And he continued: 'Germans even think of God as singing *Lieder*.'⁸⁰ My favourite remark in this regard comes from the Franco-Romanian philosopher Emil Cioran, whose general outlook on life can be inferred by the astute from the title of one of his better-known books, *The Trouble With Being Born*. In an interview in *Newsweek* in December 1989 Cioran asserted that 'without Bach, God would be a completely second-rate figure', and that 'Bach's music is the only argument proving the creation of the Universe cannot be regarded as a complete failure'.⁸¹

Music deals with that realm of experience, of such vital importance and yet so hard to express in concepts or language, which would and should be the proper object of philosophy if philosophy were only capable of dealing with it. Suzanne Langer, in her classic book *Philosophy in a New Key*, wrote perceptively:

There are certain aspects of the so-called 'inner life' – physical or mental – which have formal properties similar to those of music –

patterns of motion and rest, of tension and release, of agreement and disagreement, preparation, fulfilment, excitation, sudden change, etc.⁸²

Note that she emphasises dynamic elements, what is always becoming, where analytic philosophy accentuates always the static, what has become.

In listening we do not stand stock still on the bank of the stream with a flow gauge and a clipboard in hand, but move together with and entrained by the flow. Nothing, according to Basil de Sélincourt, is ‘more forced in music than a suggestion that time is passing while we listen to it ... our own continuity must be lost in that of the sound to which we listen.’⁸³ We are carried with and in the flow that is both ourselves and the music *at once*. We cannot tell, to coin a phrase, the dancer from the dance.

What music is also able to do is to express persistence in a changing flow, even though such a flow appears on the surface to involve its opposite, impermanence. This is Bergson’s ‘indivisible continuity of change’ which is ‘precisely what constitutes true duration.’⁸⁴ Of this, Langer writes:

The elements of music are moving forms of sound; but in their motion nothing is removed. The realm in which tonal entities move is a realm of pure duration ... It is not a period – ten minutes or a half hour, some fraction of a day – but is something radically different from the time in which our public and practical life proceeds. It is completely incommensurable with the progress of common affairs ... Such passage is measurable only in terms of sensibilities, tensions, and emotions; and it has not merely a different measure, but an altogether different structure from practical or scientific time ... *Music makes time audible, and its form and continuity sensible.*⁸⁵

Music is as different from the separate notes seen on the score as life is from the language that aims to throw its net around it; when, in Robert Graves’s phrase, the ‘cool web of language winds us in’. (As an aside, score-dependent musicians rely more on the left hemisphere, improvising musicians on the right hemisphere.)⁸⁶ In music, as in the living world,

change is permanent, stasis is transitory. ‘What is perceived’, writes Thomas Fuchs, ‘is not a sequence of discrete tones but a dynamic, self-organising process which integrates the tones heard to create a melody’. *Self-organising*, note: it is an ‘automatic synthesis, not one actively performed by the subject’.⁸⁷ In other words we have to escape the effortful sense of constructing something if we are to allow a flow simply to be. There must not be two elements here, but one. We must be actively *receptive* in relation to it, not actively expressive – as also in prayer and meditation. This image from music is a perfect example of a philosophical insight into life that is otherwise hard to express explicitly. And Fuchs sees that our lives as social beings must belong to something that is best expressed as a dance or a piece of music, if we are to enmesh, engage, connect:

It is a procedural knowledge in the sense of being accessible only in contact with others, and of being organised temporally: as a feeling for the rhythm of action and reaction, for the *crescendo* and *decrescendo* of a sequence of behaviour, for the ‘dancing steps’ of the interaction. Implicit relational knowledge is a ‘musical’ memory – one is able to hear the ‘undertones’, the ‘music’ that plays inaudibly in the interaction with the other. Also, when we speak of the sense of ‘tact’, it points to the relevance of rhythm and synchronisation for the intercorporeal sphere. Common sense is also a feeling for the proper timing.⁸⁸

In the performance of mediaeval choral music there was a pulse, or *tactus* (the Latin word for touch), a measure based on the beat of the human heart, that was developed, propagated, sensed and shared through bodily contact, singers often touching one another’s shoulders with their hands.

Single pulses appear to interrupt flow, having the nature of points, much as is a single beat on a drum. It is perhaps not accidental that the potentially disjunctive element in music, rhythm, is underwritten commonly by the left hemisphere, while the potentially conjunctive elements of music, harmony and melody are usually dealt with by the right hemisphere. Together they go to make the structure of music’s flow, a union of division and union: however, within this flow, rhythm is wholly transformed and *becomes itself*

a unifying force. This transmogrification of an element of differentiation ultimately into a force for union is essential to the nature of creation. To quote Dewey: individuality is a ‘phase, though a decisive and outstanding one, of a process having continuity’.⁸⁹

The everyday business of describing the world uses a structure of symbols – language, and in particular nouns – that leads us to believe that there are non-unique things, and that our representations of reality are the reality itself. By transcending language one may see the world as unique wholes *that themselves together constitute unique wholes at a higher level*, and so on without limit. As William James remarked:

The essence of life is its continuously changing character; but our concepts are all discontinuous and fixed, and the only mode of making them coincide with life is by arbitrarily supposing positions of arrest therein. With such arrests our concepts may be made congruent. But these concepts are not *parts* of reality, not real positions taken by it, but *suppositions* rather, notes taken by ourselves, and you can no more dip up the substance of reality with them than you can dip up water with a net, however finely meshed.⁹⁰

Reality, like the river, is a flow, which only seems to be composed of discrete drops when we try – and fail comprehensively – to catch it in the net of language: the bits that we do catch, the drops from the net, are an *artefact of our process of investigation*. No net, no drops. Similarly modern physics tells us that the entities that we discover when we probe the subatomic world are shaped by the process we use to investigate it – famously so, in the case of particles and waves. What seems to be fundamental is pattern and relationship, not the semi-distinct entities that are patterned and related. Yet immediately we sense that our everyday language is inadequate to what is meant: some differentiation is necessary for there to be anything out of which a relationship can be constituted. And yet what is differentiated can never be separate, because it is what it is *only in relationship* to everything else. This is the very essence of music.

WATER AND PHILOSOPHY

If life without music would be a mistake, life, of any kind, without water would be impossible. Schelling clearly intuited that water was a potent metaphor or symbol for the nature of reality, as indeed it is in Oriental philosophy, especially Taoism, which constantly recurs to the image of flowing water. In his treatise *On the World-Soul*, which Schelling wrote when he was only 23, he speaks of an equilibrium to life that must constantly be disturbed and re-established. Although he does not use this image, what comes to mind for me is the way in which the acrobat can balance on a tightrope only by virtue of its constant capacity for disequilibrium: if it were rigid he would fall off. And in the same passage where Schelling makes this claim, he names oxygen and hydrogen, the elements of water, as the two principles of life in the animal body, acting as ‘weights on the lever of life’, the local disequilibrium of each allowing for the maintenance of life itself at the scale of the organism as a whole.⁹¹

Yet there are aspects of the nature of water that even Schelling did not explore. John Herschel deduced in 1830 that ‘the solid, liquid and aeriform states of bodies are merely stages in a process of *gradual* transition from one extreme to the other’, which need not necessarily be separated by ‘sudden or violent lines of demarcation’.⁹² In other words bodies have solid, liquid and gaseous forms – palpable differentiations: but the forms are not necessarily abruptly distinct, but seamlessly continuous. This insight, another example of relative discreteness within a relative continuum, came from studying water.

Nothing seems more intuitive than the nature of water; yet water is a peculiar substance. Felix Franks, a physical chemist who devoted his life to studying the properties of water, concluded that ‘of all the known liquids, water is probably the most studied and least understood.’⁹³ Because of its hydrogen-bonded character, water is a liquid that flows at ambient temperatures, unlike almost any other substance.⁹⁴ ‘Not for nothing is the science of flow called *hydrodynamics*’, writes Philip Ball in his fascinating exploration of water’s nature. ‘Water is not, of course, the only substance that forms a liquid, but very few do so for the conditions of temperature and pressure under which life is comfortably conducted.’⁹⁵ And yet it has a high

degree of internal ‘structure’, brought about by the ‘stickiness’ that can ‘bind the H₂O molecules into a dynamic, ever-changing labyrinth’.⁹⁶ Elaborating on the oddness of water, Ball writes:

The hydrogen bond, then, is what sets water apart from other liquids. But it doesn’t immediately explain why water is so odd – why it is denser than ice, why it is central to life, why it has such a capacity to absorb heat and so forth. Can’t we think of water as being just like any other liquid, except more strongly bound? Not a bit of it.⁹⁷

‘It is very tough to make a good computer model of an H₂O molecule’, he writes, in a phrase that invites one to ponder: surely, of all molecules involved in life, water – two hydrogen atoms and one of oxygen – looks like one that should be rather easy to model. But the difficulty arises ‘because the way a hydrogen bond forms as two water molecules approach one another is so complex. The crucial difficulty is that *hydrogen bonds form cooperatively*, not independently.’⁹⁸ This difference, that makes computer modelling so difficult, expresses something intrinsic, I suggest, to life itself.

Life depends on water because of its very peculiarity. As Philip Ball explains, ‘when it comes to water, the refined tools of the theory of simple liquids are often woefully inadequate. It becomes like chiselling with a screwdriver or banging in nails with a mallet – you can just about get the job done, but it doesn’t always look very convincing or elegant.’⁹⁹

Water has, to use Abramowitz’s terminology, architectivity at one temperature as well as connectivity at another (see Plate 21). Ball writes:

A continuing mystery about dendritic snowflakes is why all six of their branches seem to be more or less identical. The theory of dendritic growth explains why the side branches will develop at certain angles, but it contains no guarantee that they will all appear at equivalent places on different branches, or will grow to the same dimensions; indeed, these branching events are expected to happen at random. Yet snowflakes can present astonishing examples of coordination, as if each branch knows what the other is doing.¹⁰⁰

I reported earlier something similar about the formation of deer antlers, but from this account of water, it would seem not to be a matter confined to the world of the living. The single flake comes into being as a single *Gestalt*.

Unlike almost every other liquid, when water freezes, rather than contracting and becoming more dense, it *expands* and becomes *less* dense. If this were not the case, the world would be a very different place:¹⁰¹

if the ocean bottom waters were frozen, [oceanic] circulation could not take place, with the result that northern countries would be much colder ... Hot water cools very slowly since it must lose a lot of heat for its temperature to fall significantly. So our hot water tanks and our baths stay hot for a long time. Water's large heat capacity means that warm ocean currents can carry a phenomenal amount of heat. The Gulf Stream, which ultimately keeps Northern Europe warmer than Labrador (at the same latitude) by carrying heat from tropical South America northwards across the Atlantic Ocean, bears with it every day twice as much heat as would be produced by burning all of the coal mined globally in a year.¹⁰²

One of the difficulties in modelling water is, according to Ball, precisely that the models start from stasis, not from flow: a problem to which the reader will by now be alert. 'The fundamental difficulty with all these models', he writes, 'is that they try to force a static description on a changing scene.'¹⁰³ And he goes on to elaborate:

We don't have the technologies yet for tracking huge numbers of water molecules as they play out their tactics in the real liquid. Although it is now possible to take frame-by-frame snapshots of molecular processes over the incredibly short timescales – perhaps a few trillionths of a second – during which they occur, it may never be feasible to monitor directly and simultaneously the environments and trajectories of thousands of individual molecules in a complex and messy system like a liquid.¹⁰⁴

‘Messy’: one might be forgiven for hearing there, if it were not for Ball’s delight in its ‘messiness’, the left hemisphere of the Western scientist speaking. To which what we don’t understand and can’t neatly predict is, of course, a mess.

THE ESSENTIAL PRINCIPLE OF FLOW: *LI*

However to the Eastern mind, though processes may not follow programmatic rules, they are far from being any kind of mess. An ancient Chinese concept that stems from Confucianism is that of *lǐ*.¹⁰⁵ It indicates a formal principle in all things, that is considered, together with *ch'i* (a vital force or energy, also written *qi*), ontologically prior to the cosmos itself, and to have given rise to it. This idea of generation as an energetic force entering into a receptive form is itself deeply generative.

According to Joseph Needham, *lǐ* indicates,

the order and pattern in Nature, not formulated Law. But it is not pattern thought of as something dead, like a mosaic: it is dynamic pattern as embodied in all things living, and in human relationships, and in the highest human values.¹⁰⁶

And it is not just in the living, as I understand it. *Lǐ*, as the ordering principle in the world, is something like 'reason', according to Alan Watts, but not in the now normal, Platonic, sense of that word.¹⁰⁷ It is perhaps more like what Heraclitus called the *logos*. At that stage *logos* had not yet come to mean 'reason' in the rather limited modern sense, instead meaning the common principle that makes complexity, beauty and meaningful order arise in place of chaos, both in the living world and what we consider the non-living; and gives rise to a fittingness, or rightness, or dignity, in human affairs where they arise. *Lǐ* is closely related to the idea of the *tao*, the flowing formal principle of the cosmos.

Lǐ can manifest in a wide range of patterns and intrinsically beautiful, irregular regularities found throughout Nature. David Wade, in his excellent short book *Li: Dynamic Form in Nature*, distinguishes, inevitably arbitrarily, 24 types of such pattern, which he illustrates from, amongst other things, animal markings, shells, leaves, films, crystals, eggs, insect wings, sand, webs, stalks, rock formations, soap films, cabbages, clouds, lichens, asphalt, ceramics, tree-barks, ice, parched earth, dried paint, grasses, ferns, coastlines, agates, brains, bone, particles of soot, streams, bacterial growths, and static electricity. *Lǐ* can refer to the markings in jade,

but is present above all in the patterns of flowing water. ‘We see those patterns of flow memorialized, as it were’, writes Watts, ‘as sculpture in the grain in wood, which is the flow of sap, in marble, in bones, in muscles. All these things are patterned according to the basic principles of flow.’¹⁰⁸ In the West, the technique of ‘marbling’ paper, used widely by book-binders in the past to decorate the edges, endpapers and even covers of books, makes use of ‘rather sophisticated flow phenomena in viscous fluids.’¹⁰⁹ In other words, *lǐ*.

Viewed as a guiding pattern that lies behind phenomena, yet importantly without controlling or predicting their expression in any one instance, *lǐ* has many of the same qualities expressed in the idea of the *élan vital*. It is the creative core of existence. Lao Tzu says of the *tao*, the underlying natural order of the universe:

The great *tao* flows everywhere, to the left and to the right;
it loves and nourishes all things, but does not lord it over
them.¹¹⁰

This last phrase is important. In other words it does not control, force into conformity with its will, direct or have power over what is essentially free. Its openness is more in accord with the way of being of the right hemisphere than that of the left. To know is also not to pin down: ‘knowing is not a smash-and-grab raid on the object but what [Heidegger] calls a being-with, a concern, a not-having-power-over.’¹¹¹ The power of *lǐ* is permissive, not privative: freeing up into possibility, not closing down into certainty. And as we have seen turbulence, which is what all natural flow is, and what the *tao* is, resists precise formulation, and therefore precise prediction.

Of the patterns representing *lǐ* gathered in his book, Wade writes: ‘The aesthetic appeal that links each of these examples ... derives from the attractive combination of geometry and pure chance.’¹¹² This coming together of order with disorder is highly reminiscent of the pattern of such musical forms as jazz, *raga*, and *fado* that I invoked as metaphors of existence in the first pages of this book. Even what we call ‘things’ are non-random, but also non-determined, patterns: *Gestalten*.¹¹³

RHYTHM

Nothing more strongly entrains the entire body to participate in its flow than musical rhythm. I mentioned a few pages back that rhythm might be considered punctate, and yet it turns what might have been isolated elements into a continuous, unbreakable flow, with a past and a future strongly implied in, and bound up inextricably with, its present. Rhythm could be thought of, as it undoubtedly is wherever it exists (and it exists everywhere) in Nature, as a highly ordered series of obstructions to flow, from within flow, and forming part of flow. We have seen the beautiful, regular, yet irregular, vortex formations that are caused by pulsations in a flowing liquid: oscillations are present, in some form, often extremely rapid though they may be, throughout all the processes of the cosmos. Note that an interruptive or resistive element is turned into something that does not weaken, but rather strengthens, the sense of flow it ostensibly opposes.

I also mentioned the left hemisphere's role in rhythm. But there are qualifiers, one exception being that syncopated or cross rhythms are better dealt with by the right hemisphere.¹¹⁴ And the left hemisphere is also, as one might imagine, unable to deal with long sequences:

a healthy right hemisphere appears to be more suited for the discrimination of longer rhythms than a healthy left hemisphere. This effect was seen only for the 'longer' rhythms and not for the 'shorter', probably because the latter are too simple to discriminate for an effect to be detected.¹¹⁵

The same is true of visual rhythmic patterns: as the number of elements increases, sequential processing, typical of the left hemisphere, 'becomes inefficient and the right hemisphere takes over, representing the rhythm as a single temporal pattern'. As the experimenters here conclude, 'the finding that longer rhythms yield right hemisphere superiority points to the possibility that rhythms can be processed as Gestalts, ie, whole patterns.'¹¹⁶

A *Gestalt* is not mechanically decomposable, but a pattern that is recognisable despite having no simple formula. In this it is like *li*. Here Whitehead has some interesting observations to make on rhythm:

A rhythm involves a pattern and to that extent is always self-identical. But no rhythm can be a mere pattern; for the rhythmic quality depends equally upon the differences involved in each exhibition of the pattern. The essence of rhythm is *the fusion of sameness and novelty*; so that the whole never loses essential unity of the pattern, while the parts exhibit the contrast arising from the novelty of their detail. A mere recurrence kills rhythm as surely as does a mere confusion of differences.^{[117](#)}

This is the essence of the phenomenon known as *rubato*, where slight slowings or accelerations in tempo are detectable, and bring expressive life to the music; but subliminal rhythmic changes are always present in human music, which is why mechanical rhythms are so dull, and even offensive to the ear. Remember that in the beating of the heart – and not just the foetal heart, but the adult heart – mechanical regularity is a warning sign.^{[118](#)}

Whitehead believed there was a close identification of rhythm with ‘the causal counterpart of life; namely, that wherever there is some rhythm there is some life, only perceptible to us when the analogies are sufficiently close. The rhythm is then the life’.^{[119](#)} And where there is life, there is rhythm. Elsewhere he observes that what he calls ‘the Way of Rhythm pervades all life and indeed all physical existence. This common principle of rhythms is one of the reasons for believing that the root principles of life are, in some lowly form, exemplified in all types of physical existence.’ And he notes that these rhythms form unending cycles, in which the end of one cycle initiates the seamless beginning of the next.^{[120](#)}

THE FLOWING LINE

We have often had reason to return to the difference between a curving motion and a rectilinear motion. Curvature, as I have suggested, is more characteristic of the intellectual world of the right hemisphere, in which opposites can be reconciled, in which the direct approach may for many purposes be inferior to the indirect, and in which continuous variation is united with coherent pattern. Curves are complex, like turbulence: straight lines are simple. Curves are also more sympathetic to the natural world, in which there are no straight lines.¹²¹ In particular, one might say that curves have a living quality that straight lines lack.

In relation to that, I might mention a reader who wrote to me to say that he started getting tattoos a few years ago, beginning with a tree shape on his left shoulder. He quickly found that he wanted the left side of his body to be characterised by natural and organic forms and his right side by geometric and linear designs. It wasn't until he read *The Master and His Emissary* that it struck him that he had 'naturally gravitated to a left/right brain way of thinking about my tattoos and literally embodied that idea with ink on my skin'.

Sterne's Corporal Trim demonstrates freedom with a flourish of his stick:

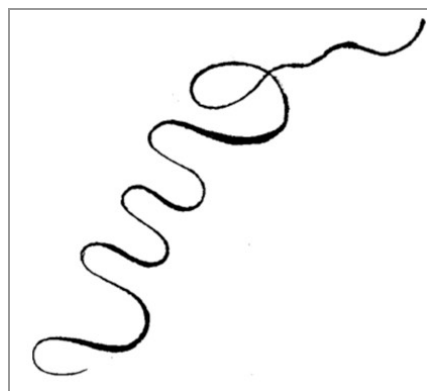


Fig. 52. Corporal Trim's flourish, from *Tristram Shandy*, by Laurence Sterne (Bk IX, 1767)

And Tristram Shandy gives the storyline of Book V as something that looks in places fortuitously like a deranged electrocardiogram, with plenty of vital variability:

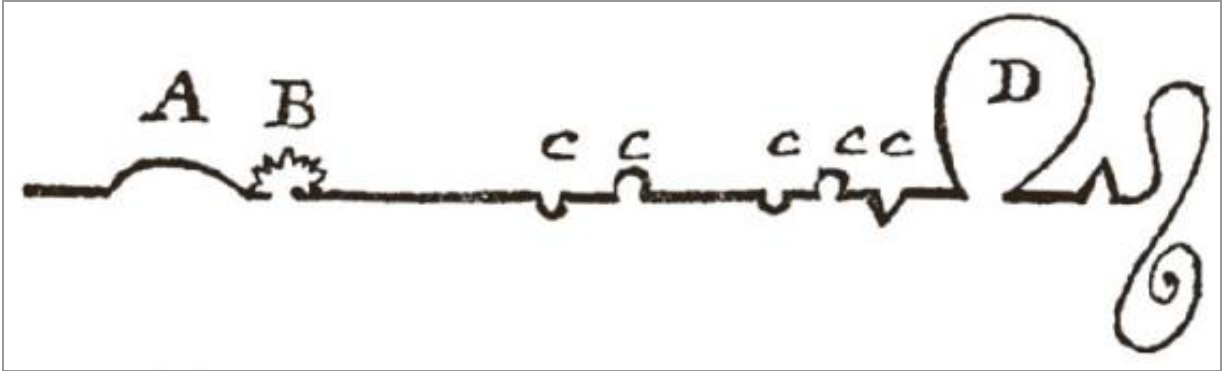


Fig. 53. The plot structure of Tristram Shandy (Bk VI, 1761)

The connexion between curved lines and life was made by William Hogarth in his *Analysis of Beauty*, in which the ‘Line of Beauty and Grace’ is depicted as a slender serpentine double curve (see Fig. 54).¹²²

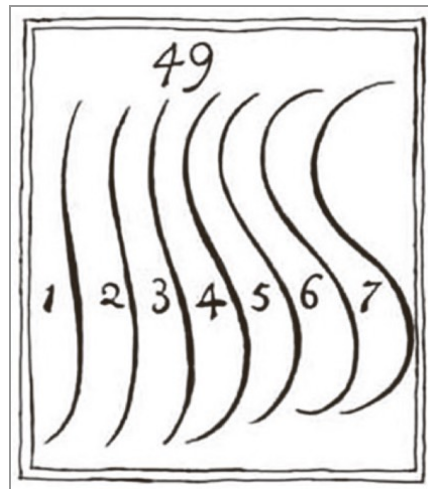


Fig. 54. Variations on the serpentine curve, by William Hogarth.
‘Strictly speaking, there is but one precise line, properly to be called the line of beauty, which in the scale of them is number 4’ (from *Analysis of Beauty*, 1753, 49)

Alberti had made the same point in his treatise *On Painting*, in the fifteenth century, where he finds the beauty of such a line embodied in the

depiction of a woman's flowing hair, or a horse's mane, which should 'swirl' or 'wave in the air while it imitates flames', rising 'sometimes in this or that direction'.¹²³ And Herder, in his treatise on sculpture, writes of 'the beautiful line that constantly varies its course': it is never 'forcefully broken or contorted, but rolls over the body with beauty and splendour; *it is never at rest but always moving forward*'.¹²⁴

There is indeed something fearful – like the tiger's symmetry – about the straight line, which has so come to dominate our world in the last hundred years. I mentioned Hundertwasser's view that 'the straight line leads to the downfall of mankind'.¹²⁵ Bergson seems to have seen that what he called intellect could only approximate the living curve that intuition could reach directly. Like the tangents that approximate a circle without ever reaching it, he thought that analytic thinking has to try to approximate the findings of intuition by a series of short straight lines that zigzag around its path, making an endless series of corrections, where intuition enters the line at one stroke.¹²⁶

Spirals and vortices bring order into being out of chaos. Early Celtic and Teutonic cosmologies held that life emerges from a vortex, an idea also common to many pre-Socratic Greek philosophers. Anaximander moved away from the idea that there was some single primordial substance – such as Thales' water or, later, Heraclitus' fire – towards the idea that there was an indefinable something (*apeiron*) that expressed itself in an eternal motion, which brought everything into being by a reciprocation of opposites.¹²⁷ A vortex is such a tension between opposing forces, specifically centripetal and centrifugal forces, and thus it both separates and combines. Later Anaxagoras and Empedocles agreed with Anaximander that this motion is a vortex. Indeed according to Democritus, 'the cause of coming-into-being of all things is the vortex'.¹²⁸

Is movement more generally, then, foundational?

THE PRIMACY OF MOTION OVER STASIS

At some deep level, reality requires both elements of motion and (relative) stasis, the wave and the particle, the continuous and discrete. However, if the continuous and the moving is best appreciated by the right hemisphere, the discrete and static is best represented by the left hemisphere. It would not be surprising, therefore, if we found that they are not quite symmetrical in ontological status, with the continuous being the ontological primary – albeit in reciprocal relation with the discontinuous.

This primacy of union over division, however necessary division might be, is reflected in the fact that one can move from an extended whole in space or time to parts (though losing almost everything on the way), but not from the parts to the whole. This point of view, which we have associated with Bergson, has been advanced by many philosophers, and was anticipated by Leibniz. Indeed Leibniz denied that anything real could ever be an aggregate of parts:

I believe that where there are only entities through aggregation, there will not even be real entities ... To be brief, I hold as axiomatic ... that what is not truly *one* entity is not truly one *entity* either... ¹²⁹

Similarly Leibniz remarks that mathematical points, ‘even an infinity of points gathered into one, will not make extension’. ¹³⁰ So extension in space and extension in time cannot be constituted by aggregation of points or parts. Both of these ideas are expressed more eloquently by Bergson and by James, but my point is that they are not confined to a ‘Bergsonian’ or ‘Jamesian’ view: they are there in the European tradition well over 200 years previously, and are mathematically correct according to Leibniz, the inventor of calculus.

And since a point is conceived as static, no matter how many of them you have, you can never get from a point or points to motion. ‘How can one fail to see’, says Bergson, ‘that the essence of duration is to flow and that one static element stacked on another will never result in anything that has duration?’ ¹³¹

However, you may say, a flow, while it cannot be made up (prospectively) from static parts, could have recognisable ‘regions’ in it once it has come into being. So when Bergson says: ‘We shall think of all change, all movement, as being absolutely indivisible’,¹³² he does not mean that it cannot be retrospectively divided, but that such a division can apply only to the representation, not to the entity itself, whose essence is change, motion, flow. His point is that the representation has lost the very element – duration or extension – that is the essence of what it tried to capture. For, once time – or motion – is *retrospected* on, it is *no longer time or motion*. In attempting to account for a pure process of change analytically, we can do so only by reducing it to parts time and again, until at last we reach something that no longer changes. But, at the very moment we exclaim ‘Finally, I have it!’, we have, by definition, only immobilities; and from them no change can ever emerge. The change we were trying to account for must forever elude our *grasp*.

If change, which is evidently constitutive of all our experience, is the fleeting thing most philosophers have spoken of, if we see in it only a multiplicity of states replacing other states, we are obliged to re-establish the continuity between these states by an artificial bond; but this immobile substratum of mobility [see note], being incapable of possessing any of the attributes we know – since all are changes – recedes as we try to approach it: it is as elusive as the phantom of change it was called upon to fix.¹³³

As for metaphysicians’ attempts, from Zeno onwards, to account for motion and change, Bergson says that ‘of change they retained what does not change, and of movement what does not move.’¹³⁴

All motion requires both a following and a headwind: it requires resistance, some degree of friction. If everything moved in the same direction at the same speed in a frictionless universe, this would effectively be stasis: motion is always relative to something. Since there is no framework by which one element can be granted fixity, it is thus always a matter of both, or all, parties moving, never just one.

A defining quality of all living things is that they move purposively – growth being a form of motion; and we have seen that in order merely to

remain in existence they need constantly to change. Aristotle recognised that locomotion is only one of four types of movement, the other three being growth, decay and change of state (metamorphosis), all of which are present in plant life.¹³⁵ Animals, unlike most plants, are locomotive, and spend a great deal of their often costly energy in moving, sometimes over very large distances. Motion is important to continuing life, if nothing else. But it is more important even than that, as I shall suggest: an irreducible facet of being itself.

Earlier I considered a particular kind of motion which followed logically from the discussion of time, namely the motion of flow, and how it represents both continuity and discontinuity *together*. This is, I believe, of some philosophical importance. Now I want to broaden the discussion to consider the grounding role of movement in general.

First, though, we should explore the role played by motion in grounding all aspects of our mental life.

MOTION AND COGNITION

Our knowledge is derived from action and interaction with the world. Before we have language or concepts, we are navigating and manipulating the world, solving problems, making decisions and coming to an understanding of, not just the world, but ourselves – purely through moving about in it.

In a letter to *Nature* in 1887, Francis Galton takes issue with the philologist Max Müller's idea that thinking depends on language.¹³⁶ He makes two points that are relevant here. One needs to be mentioned only in passing. In suggesting that prowess at chess owes nothing to language, he remarks: 'I myself cannot conceive that the names – king, queen, &c. – are of any help in calculating a single move in advance. For the effect of many moves I use them mentally to record the steps gained, but for nothing else.' What he points to is that we mainly do not think in language, but *record* thought, after the event, in language. It is another example of the retrospective, rather than prospective, aspect of left hemisphere function. I have to say that, though Galton is certainly right about certain kinds of thought, it is my experience that some branches of thought become fully formed only through their elaboration in language – so, while language is neither necessary nor sufficient for thought, it nonetheless often plays an important part in the process, even if its effect can also be obstructive.¹³⁷ It provides 'necessary resistance'.

His other point is more telling. Using examples from his favourite activities – which include both inventing and mending 'mechanical contrivances', tools and mechanisms; playing billiards and chess; indulging in fencing, climbing and scrambling – he makes it clear that bodily movement itself, not language, is the key element in most of our thoughtful interactions with the world. And he carries on to emphasise that even reasoning emerges from motion. He refers to Binet's *La psychologie du raisonnement*, published the previous year, which had emphasised 'the important part played by visual and motile as well as audible imagination in the act of reasoning'; as well as to numerous instances of thought depending on an active, embodied engagement with a scene, involving *movement* – certainly not on any form of words.¹³⁸

That was 130 years ago. The idea that thought depended on bodily movement did not fit with the scientific prejudices of the age. The close relationship between embodiedness and cognition is now appreciated, but conventionally has not been taken into account in the analytic tradition of philosophy, which has been happy to entertain, for instance, accounts of ‘brains in vats’ as useful ways to arrive at an understanding of the human mind.

It is only in recent years that we have begun to take notice of, and learnt very much more about, the role of the body in cognition. The argument that the contribution of literal and explicit thinking is minimal compared with largely metaphorical, unconscious thinking, rooted in the body, was put forward by George Lakoff & Mark Johnson in their *Metaphors We Live By* and *Philosophy in the Flesh*; and Guy Claxton has marshalled an impressive array of evidence that takes the argument further, in his *Intelligence in the Flesh*. ‘We think through the body’, writes Matt Crawford. ‘The boundary of our cognitive processes cannot be cleanly drawn at the outer surface of our skulls, or indeed of our bodies more generally. They are, in a sense, distributed in the world that we act in.’¹³⁹

I’d like to consider motion from a number of different angles, each of which may tell us something different about its significance. First, I will look at what brain structure and function, both normal and abnormal, can tell us about the part played by motion in different aspects of our experience. That will lead naturally to a consideration of the relationship between motion and various aspects of the psychology of phenomenal experience: thinking, feeling, perceiving, and social intelligence. From there I will venture into some reflections on motion in ontological terms. What I aim to show is that motion is at the core of every aspect of our experience, and of our ability to make sense of it, in a way of which we are normally unaware, because our analytic intellect cannot deal with it; and that motion is foundational to existence, and stillness merely the limit case of motion, not stillness primary, and motion some form of aberration or disturbance of the foundational inertia.

MOTION AND COGNITION: IN THE BRAIN

Mind and body are inseparably connected. The conventional divide between thinking and motor function simply can no longer be supported. The dichotomy is, in fact, entirely misleading, as has been confirmed in a number of interesting ways. And some of the evidence, once again, comes from diseases of the nervous system.

We know that just thinking about a certain activity motivates parts of the brain connected with performing the action, and causes subtle changes in tone of the relevant musculature – so much is thinking bound up with bodily action. Just reading action words activates motor systems; words, such as ‘kick’ or ‘lick’, change activity in those areas of the brain having input to the legs and mouth, respectively.¹⁴⁰ Equally, the converse is true: movements of the hands affect the processing of words for actions involving the hands, and the same is true of the feet.¹⁴¹ (Reading nouns with strong taste, smell or sound associations has been shown to activate the relevant sensory brain regions.¹⁴²) When we comprehend sentences, we internally simulate the state of the world described in them.¹⁴³ The term ‘motor cognition’ has been adopted to cover those aspects of cognition involved in planning, executing, understanding and imagining bodily movements and actions.¹⁴⁴

The close connexion between thinking and moving is evident, too, in pathology. Some of the same proteins and genes are involved in both classically ‘motor’ diseases, such as motor neurone disease, and in classically ‘cognitive’ diseases, such as frontotemporal dementia.¹⁴⁵ In what used to be thought of as purely movement disorders, we now recognise that aspects of cognition are affected.¹⁴⁶ For example, motor neurone disease, as its name suggests, has been conventionally thought of as affecting only the neurones of the peripheral nervous system, ones that convey motor commands to muscles. To a large extent this is correct; but more recently physicians have become aware that patients with motor neurone disease have word-finding difficulties.¹⁴⁷ In fact clear language deficits can be detected in about half of patients with motor neurone disease.¹⁴⁸

What is significant is that in these conditions it is the retrieval of *action words* that is principally affected. According to the neurologist Thomas Bak, a leading figure in the world of embodied cognition pathology, every single reported patient with motor neurone disease and cognitive impairment that has been tested on generating or processing nouns versus verbs, showed a more pronounced deficit for verbs, with a difference in performance of up to 50%.¹⁴⁹ Similar word retrieval problems affecting specifically verbs have been repeatedly found in other movement disorders such as Parkinson's disease,¹⁵⁰ progressive supranuclear palsy¹⁵¹ and cortico-basal degeneration,¹⁵² as well as in other rarer conditions.¹⁵³ We saw earlier that disrupting the speech motor cortex disrupts comprehension of action words.

That is not, however, because verbs are simply the first to go whenever there is cognitive impairment – indeed the reverse is generally true. Though children acquire nouns before verbs, once acquired verbs are tenacious: in cognitive impairment adults tend first to lose not verbs but nouns. While it is true that some forms of dementia spare nouns, some spare verbs, and some spare neither, nouns are generally more vulnerable than verbs. The first description of someone who had lost the use of verbs was made in 1744 by the philosopher Giambattista Vico: 'There is a good man living among us who, after a severe apoplectic stroke, utters nouns but has completely forgotten verbs.'¹⁵⁴ By an odd coincidence, the first description of the converse, loss of noun retrieval, was made in the following year, 1745, by the botanist and physician Carl Linnæus: as far as we know, he had no knowledge of Vico's case.¹⁵⁵

The cognitive deficits that accompany motor diseases may be an inalienable consequence of the close connexion between action and thought. I alluded in Chapter 12 to the well-known Hebbian formula in neuroscience that 'what fires together wires together' – that is to say, repeated use of a particular neuronal pathway causes structural changes which further facilitate its future use. Since we now have evidence that neurodegeneration may spread along the reinforced synaptic connexions created by this process, Bak has coined the phrase 'what wires together *dies* together'.¹⁵⁶

It seems clear, however, that the key difference is not a grammatical one – nouns versus verbs, as such – but an experiential one – in as much as nouns tend to suggest objects, and verbs tend to suggest action. The brain's

connexions between thought and motion are mediated through imagined experience, not through linguistic rules.

MOTION AND COGNITION: WHAT THE CEREBELLUM CAN TEACH US

Until the last 50 years, the cerebellum, or ‘ancient brain’, which lies below and behind the cerebrum, or ‘new brain’, was thought to be more or less confined to co-ordinating motor behaviour. Its name means the little brain – it has only about 8–10% the volume of the cerebrum¹⁵⁷ – yet it contains an astonishing 80% approximately of all the brain’s neurones.¹⁵⁸ This is particularly striking since, as the number of neurones increases, the number of connexions does so exponentially. It seems unlikely that this vast complexity, so much greater than that of the cerebrum – what we normally think of as our ‘brain’ – is devoted entirely to finessing motor control. (It is of no little interest, incidentally, that while consciousness can be sustained by just a fraction of the normal volume of the cerebrum, the entire cerebellum, with its vastly greater interconnective potential, cannot sustain consciousness on its own.)

In recent years, we have come to learn that the medial cerebellum, in particular the central part known as the vermis (literally, from its appearance, the ‘worm’), plays a key role in emotional and social interaction. Abnormalities of the cerebellar vermis,¹⁵⁹ and the medial cerebellum more generally,¹⁶⁰ have been linked to autism and similar affective and social disorders.¹⁶¹ There is a particularly close relation between movement and social cognition, since thought, feeling and social connectedness depend on, and in turn reinforce, shared resonances of movement, both in action and perception.¹⁶² At the same time, principally lateral cerebellar regions have been linked to a variety of more purely cognitive deficits.¹⁶³

There are close links between the cerebellum and all parts of the brain.¹⁶⁴ We now know that projections from cortical areas direct to the cerebellum and to the pons (the part of the brainstem that forms the ‘bridge’ between the rest of the brain and the cerebellum) are concerned, not only with motor functions, but with an array of non-motor functions, including spatial awareness, spatial memory, higher-order visual processing and language.¹⁶⁵ In relation to time intervals, the cerebellum is important for their *perception*, not only, as was once thought, for the execution of motor

responses to them.¹⁶⁶ There are also projections from many areas in the prefrontal cortex – the most lately evolved part of the brain – to this ‘ancient brain’, projections which are critical for what we conventionally consider the highest-order processes, including complex reasoning, judgment, attention and working memory.¹⁶⁷ Pontine nuclei exchange information of motivational and affective significance with association areas throughout the brain in many modalities.¹⁶⁸ It is now beyond doubt that an important role is played by the cerebellum in the acquisition of higher-order cognitive, affective and social skills.¹⁶⁹ And in an earlier chapter I referred to its possible role in creativity.

In fact we had reason to suspect that this might have been the case nearly two centuries ago, but the information was overlooked because it did not fit with the pervasive assumption that motor skills must be separate from cognitive and emotional skills. The first description of intellectual deficits in a patient with cerebellar agenesis is by Combettes in 1831, who reported the case of an 11 year-old girl with serious cognitive, linguistic impairments whose cerebrum appeared normal at autopsy, though she completely lacked a cerebellum.¹⁷⁰ Since then a handful of other cases (14 to date) of cerebellar agenesis have been described.¹⁷¹ Non-motor impairments caused by cerebellar disease or dysfunction may involve visuo-spatial construction, conceptual understanding and organisation of sequential behaviour,¹⁷² and may also include perseveration, distractibility, lack of mental flexibility and disturbances of grammar, as well as deficits in working memory. Such a persistent pattern of interlinked executive, visuo-spatial, linguistic, and affective impairments is now known as ‘cerebellar cognitive affective syndrome’.¹⁷³

In the late 1960s, the developmental psychologist James Prescott developed the hypothesis, based in part on his observations of experimental monkeys, that stimulation by movement was an important element in normal emotional development.¹⁷⁴ What if abnormal patterns of emotional behaviour – being withdrawn, apathetic, autistic or hyperactive, for example – which all had motor aspects, could be at least in part attributable to dysfunction of the cerebellar regulatory system?

To Harvard neurologist Jeremy Schmahmann, it seemed possible that whatever the cerebellum did for motor control, it might also do for behaviours outside the motor domain.¹⁷⁵ In the same way that the

cerebellum regulates the rate, force, rhythm and accuracy of movements, it might regulate the speed, capacity, consistency and appropriateness of mental or cognitive processes. He called this the ‘dysmetria of thought’ hypothesis, referring to the Greek-derived term (dysmetria) conventionally applied to the ataxic gait or disproportionate and unco-ordinated movements associated with cerebellar lesions. Symptom complexes in the cognitive and affective domain, he reasoned, could also be seen as reflecting exaggeration or diminution of responses to the environment, similar to those in the motor domain.¹⁷⁶ Dysmetria of thought, then, would according to this hypothesis, eventuate in disjunctive and disproportionate elements of social interaction.¹⁷⁷

A range of motor, cognitive and affective disorders in patients with focal lesions in the cerebellum, and subcortical regions such as the basal ganglia or thalamus, are similar to those that are caused by lesions of the cerebral cortex, though often with qualitative differences.¹⁷⁸ In *The Master and his Emissary*, I described, for example, how widely different, but experientially coherent, phenomena across the motor, affective and cognitive realms could be elicited by minute variations in the positioning of an electrode in the subthalamic nuclei, themselves tiny structures only millimetres in diameter, deep below the cortex.¹⁷⁹ What one sees there, as in the cerebellum, is that complex phenomena at the highest level are already coherent wholes – ready-to-go, as one might say – at this apparently low level, well below conscious awareness. There the motor, affective and cognitive elements are *inextricably linked in ways that have human meaning*, and do not need to be combined or ‘assembled’ mechanically by any higher process. We are used to thinking that the higher functional level must unite what is separate at a lower level; but it is just as likely that what is united at a lower level is separated at a higher level. As I suggested in *The Master and his Emissary*, the ‘binding problem’ – how all those little ‘modules’ we have identified get ‘put together’ into one more or less seamless whole – may be an artefact of our chosen epistemology.¹⁸⁰

My point in this excursus has not been so much to explore the contributions of the cerebellum in and of themselves, intriguing though recent research in the area may be, but to illuminate the inextricable alliance in the brain *at every level* – phenomenological, physiological and neuroanatomical – between motor control and all aspects of thought,

including not just perception but complex cognition and emotional and social regulation.

MOTION AND COGNITION: SCHIZOPHRENIA AND AUTISM

I mentioned that some theories of autism implicate the cerebellum; and we have seen that there motion, cognition and emotion are closely related. It is informative to take a closer look at abnormalities of movement in autism and schizophrenia – *not* in an attempt to localise any one ‘function’, be it in cerebellum or cerebrum, but purely to demonstrate how these aspects of experience vary together, wherever they may be found in the brain.

Organisms move as a whole, and their movement is characteristically fluid: machines work by action of part on part, and their motions typically lack organic fluidity. And in a sense what the schizophrenic subject, and to some extent the autistic subject, experiences is something like a mechanisation of time, experience and the body.

I mentioned that schizophrenic subjects have an altered sense of time, but I did not particularly emphasise one highly characteristic aspect of it, the jerkiness of its tempo. Like right hemisphere-damaged subjects, they experience the time-lapse (*Zeitraffer*) phenomenon: one subject, for example, explicitly reported that ‘time wasn’t moving slowly, but in jerks’.¹⁸¹

‘When I move quickly it’s a strain on me’, reports another patient. ‘Things go too quickly for my mind. They get blurred and it’s like being blind. It’s as if you were *seeing a picture one moment and another picture the next*.’¹⁸² Life itself becomes a series of snapshots, and, as Sass reflects, there is ‘the feeling that there are gaps between one moment and the next’, as under a strobe light.¹⁸³ A patient of Jaspers reported that

he only saw the space between things; the things were there in a fashion but not so clear; the *completely empty space* was what struck him.¹⁸⁴

One of Minkowski’s patients actually ‘conceived of the idea of putting a buffer day between the past and the future. Throughout this day I try to do nothing at all. I will go for forty-eight hours without urinating’.¹⁸⁵ Another makes the explicit connexion between his awareness that if there are

‘instants’, there must be gaps, an ‘emptiness’ – a ‘nothing’ – in between the instants:

I feel like in the movie *Groundhog Day*: time and again I wake up, and the same things happen again and again. That’s how I feel – like in a dream ... All other people live a normal life, but for me, it’s different, it’s like *cut–cut–cut* ... I look at an entity, and I look at other entities, and there is emptiness in between, there is *nothing in between*.¹⁸⁶

This disjointed aspect of time experience passes over into cognition. In many schizophrenics, there are characteristically jerky connexions (or lack of them) in thought and its expression, known as ‘knight’s moves’, after the right-angle turns made by a knight in chess. There the flow of thought, like the flow of time, is no longer continuous: there is a loss of ‘a smooth train of thought’.¹⁸⁷ And sometimes it stops altogether in a common symptom of schizophrenia known as ‘thought block’, when a line of thought suddenly disappears in mid-train. No motion at all: ‘nothing in between’.

By contrast, depression tends towards right hemisphere dominance; and as Sass & Pienkos report ‘many depressed patients in fact experience an increase in the number of thoughts. These are experienced as co-existing simultaneously in an unpleasant continuous flooding.’¹⁸⁸

The connexion between disjunctive thought processes and a disjunction of the experienced world is made clear by one of Minkowski’s patients: ‘the ideas which he had entertained seemed ... to have appeared in isolation, with no links between them’, and as a result ‘his whole life seemed to have evolved in fits and starts. It was not a continuous line, supple and elastic, but one that was broken in several places.’¹⁸⁹

Inevitably this discontinuity further passes into bodily motion, both its perception and execution. Remarkably, schizophrenic subjects often perceive smooth biological movement itself as jerky, discontinuous – and even *unnatural*. In other words, machine-like.¹⁹⁰ And both the way we experience and perceive movement are related reciprocally to our capacity for emotional and *social* cognition. Deficits in the one area cause deficits in the other.¹⁹¹

On testing, schizophrenic subjects have difficulty distinguishing human from random movement, or normal from abnormal biological motion.¹⁹² They are impaired in the processing of *coherent* motion, which requires ability to see the whole. In keeping with this, local motion processing may be relatively intact, but global motion processing lost.¹⁹³ It is, however, at the global level that one must understand the fluid movements of a living body.

The loss of smoothness in the perception of movement appears to be particularly associated with a disturbed sense of self: patients who report this loss also endorse statements such as ‘I have difficulty in forming my own opinion’ and ‘I have lost my own self’.¹⁹⁴ This is in part due to the loss of the coherence-giving *Gestalt*, the sense of a life and person as an embodied whole enduring over time.

Thinking and moving, perceiving and acting, are bound up with and reflected in one another. Walking has been long considered an aid to fluent thinking – the philosophical school founded by Aristotle was known as ‘peripatetic’, from the habit of walking while discussing philosophy. There is an observable and reciprocal relation between objectively fluid movement on the one hand, and subjectively fluid cognition and creativity on the other.¹⁹⁵ Since both subjects with schizophrenia and those with autism have an impaired sense of fluid time, we should expect them also to display loss of fluidity in cognition, difficulties in perception and interpretation of motion – and a loss of fluidity in their observed bodily movements. And they do exhibit all three: flow has been replaced, across all domains, by the jerkiness of ‘successive segments’ of motion or time.

At times, indeed it can leave the subject rooted to the spot: ‘I get stuck, almost as if I am paralysed at times. It may last for a minute or two but it’s a bit frightening.’¹⁹⁶ I mentioned the tendency to immobility in schizophrenic subjects in Chapters 9 and 22. According to Minkowski, ‘their posture and behaviour bear the stamp of this morbid immobility. It shows itself in their stereotyped movements, which are a kind of perpetual repetition of one movement.’¹⁹⁷ And it is there in thought, too: so-called ‘thought perseveration’, an obsessive repetition of insignificant thoughts or mental images; ‘thought echo’, a feeling that one’s thoughts become automatically and involuntarily repeated; and *Gedankenlautwerden* (literally, ‘thoughts become audible’), the feeling that one’s thoughts are already anticipated and uttered out loud an instant before one ‘has’ them.

Kretschmer noticed what he called a ‘jerkiness of motor tempo’ in schizophrenia spectrum disorders.¹⁹⁸ There was, he thought, ‘a peculiar military stiffness in expression and movement, as an inherited peculiarity in schizoid families’, affecting them ‘somatically and psychically alike’.¹⁹⁹ He related it to the progression of the condition itself. He called affective psychoses ‘circular’ psychoses, because they moved in cycles, whereas schizophrenic psychoses come in jerks. Something had got out of order in the inner structure. The whole structure might collapse inside, he observed, or perhaps only a few slanting cracks might appear. But in the majority of cases there remained, he thought, something that never got patched up.²⁰⁰

Changes of temperament in such subjects, too, are, he says, ‘abrupt, jagged’: ‘schizoids vary between tenacious and jerky’ in their style.²⁰¹ If schizophrenia is an example of bodily motion being dislocated in parallel with emotional and social cognition, one might expect Kretschmer’s ‘cycloid’, that is to say, affective, psychoses (for whom the right hemisphere and its sense of time are relatively intact) to show normal motor fluency. Kretschmer reports that in them ‘motor expressions and movements are well-rounded, fluid and natural.’²⁰²

A literal jerkiness of body movement is already found in the prodrome to schizophrenia (ie, before the illness is manifest).²⁰³ Similar disturbances of fluidity of motion have been found in autism. Both Leo Kanner, who first described classical autism, and Hans Asperger, after whom Asperger’s syndrome is named, noted motor abnormalities such as ‘sluggish’ reflexes, ‘clumsy’ gait and an absence, from an early age, of anticipatory postures when being picked up.²⁰⁴ Autistic children who have never been treated with medication display ‘a stiffer gait’, in which the ‘usual fluidity of walking’ has been lost.²⁰⁵ Individuals with autism display instability, during both standing and walking, have impairments in gait, posture, balance, speed and co-ordination, as well as fine motor control (often evidenced in handwriting), and they move ‘more jerkily’, and with unusual acceleration.²⁰⁶ The degree to which this is the case correlates with the severity of autism, and with a tendency to perceive the motion of living things as not just hard to interpret, but as positively unnatural.²⁰⁷ Some subjects report a lack of ‘feedback’ from the body: some describe lacking awareness of their own facial expressions, movements or the position of their limbs in space.²⁰⁸ One person with autism writes:

I think the fluidity of access to various places in my brain is dependent upon neurological movement between places ... Sometimes my speaking is hindered, other times my thinking, and sometimes my physical movement. The hardest is when thinking is not working smoothly. When that happens, I have to line up one thought at a time, *like train cars*. I like it much better when my thoughts do not have to be methodically lined up, but are more *fluid* ... [209](#)

Like train cars: an evocative description of the difference between explicit serial connexion of parts and the flow of the whole.

Observe the fluidity of the natural walking movement of someone from a non-industrialised culture, compared with our generally awkward, angular, graceless way of moving. Smoothness of motion has disappeared from modern life: the strobe and the break-dance – are they in some ways reflections, even celebrations, of this? Whether that be the case or not, the fragmentation of modern culture, with its abrupt nonsensical transitions, sometimes accidental, as with juxtapositions on television, and sometimes contrived deliberately, as in postmodern art, mimics this loss of flow.

MOTION AND COGNITION: THE HEMISPHERES

Distinct regions of the right hemisphere are given over to perception of motion in general, of biological motion, and, separately, of human motion.²¹⁰ I have mentioned that the right posterior superior temporal sulcus is crucial to the perception of others' bodies and bodily motion, and is particularly strongly activated during the perception of eye or mouth movements, body language, and biological motion of all kinds.²¹¹ Suppressing the right superior temporal sulcus causes a loss of ability to discriminate living motion, whereas suppressing the same region in the left temporal lobe produces no significant result.²¹²

The same right hemisphere region is involved in assessing the goals and intentions underlying another's movements – again, motion, emotion and meaning are closely linked.²¹³ The closely associated (and physically proximate) right fusiform gyrus is critical for reading facial expressions.²¹⁴ Independently it has been shown that if right hemisphere attention is compromised, we lose the intuitive understanding of motion.²¹⁵ And we have seen that the perception – and the enactment (since they are inseparable) – of human social relations is also highly dependent on the right hemisphere.

Tying in with the findings in autism and schizophrenia, a review confirms the findings of at least six earlier studies, showing that motor stability and coherence of gait and posture were more affected by right hemisphere deficits than by left.²¹⁶ According to Coslett & Heilman, 'the right hemisphere is dominant for motor activation or intention'.²¹⁷

MOTION AND COGNITION: THE EMERGENCE OF THE PHENOMENAL WORLD

Analytic thought and language tend to immobilise the world. John Cutting notes that the phenomenological reduction envisaged by Max Scheler, a thought experiment whereby ‘the real world and everything of it which pertained to a human being was envisaged as cancelled out’, is strikingly close to the world as experienced by the schizophrenic subject, and he details 11 respects in which this could be said to be the case.²¹⁸ The one that interests us for now is what Cutting calls ‘adynamy’.

This is not *just* the abolition of motion, which we have already seen very clearly is an aspect of the schizophrenic world, but the abolition, too, of the connexions that make sense of the world. For the subject, nothing any longer happens by chance; and at the same time causal relations are misunderstood, seeing them where they cannot be, and failing to see them where they must be. Chance and causation both depend, in different ways, on motion, and in schizophrenia the subject abjures motion, strives to eliminate chance, and forms disrupted causal – or in truth non-causal – connexions. This is just like the ‘phenomenologically reduced’ subject described by Scheler, who ‘not only loses any sense of accident or chance in their experience but any sense of movement as well’. Cutting quotes Scheler:

There disappear all causal interconnections because reality itself is the basis of all such causes. The result of this is that the reduced world is a perfectly adynamic world – nothing has an effect on anything else any more.²¹⁹

Thus, as Cutting expresses it, the world is ‘frozen in time, *because nothing causes anything to move*’.²²⁰ We saw many accounts of this from the mouths of patients themselves in Chapter 9.

Wittgenstein repeatedly remarks on the way that stopping acting and engaging with the world in order to reflect on it makes things appear alien. His thrust as a philosopher is to help us get on with things, to ‘move about

around things and events in the world instead of trying to delineate their essential features'.²²¹

Perception is certainly altered by movement and action in the world. Perception appears on the face of it to be a passive process (in an age in which the camera has become the false analogy for perception). Yet it is an active process in which we go to meet phenomena. There is widespread evidence that the motor and visual systems are intrinsically linked and mutually influence each other. Observations and perceptions affect movements, and movements affect observations and perceptions. Sometimes the process may unduly affect judgment: for example, observers lifting boxes perceive the weight of an object being lifted by an actor in a way that depends on the weight of the box that they themselves are lifting,²²² and walking affects one's judgments of the speed of another walker.²²³ Measurement, then, may sometimes be better from a static position (measurement depends largely on the left hemisphere which tends towards stasis); but learning how to move, or react, or to understand the *meaning* or *purpose* of a movement or action, depends on reciprocity of action and observation. In general this process aids rather than distorts perception.²²⁴ Disrupting motor regions temporarily (using transcranial magnetic stimulation) distorts judgments about actions;²²⁵ and patients with motor deficits have deficits in action recognition.²²⁶ But that is just the tip of the evidence iceberg: motion and perception are clearly and deeply intertwined.²²⁷

The idea that perception is altered by, and may even be secondary to, activity is familiar from the *Gestalt* theory of perception, according to which we are co-operatively constructing the aspects of the world that we see. It was already there in the thinking of John Dewey, who, in a now famous essay on the nature of the 'reflex arc', wrote in 1896 that

upon analysis, we find that we begin not with a sensory stimulus but with a sensori-motor coordination ... and that in a certain sense it is the movement which is primary, and the sensation which is secondary, the movement of body, head and eye muscles determining the quality of what is experienced. In other words, the real beginning is with the act of seeing; it is looking, and not a sensation of light.²²⁸

The so-called perceptual ‘stimulus’ and motor ‘response’ cannot be considered separately, outside the context of their interaction, though Dewey hints that indeed the motor element – normally seen as the response – may be primary. Perception is an active, not a passive process – or better, it is a profoundly interactive process. Movement lies behind, and in, every one of our senses.

This idea has gathered further scientific backing in recent years. The Colombian neuroscientist Rodolfo Llinás has argued, starting from the examination of simple marine invertebrates such as the sea squirt, that the capacity for motion underlies all knowledge:

What I must stress here is that the brain’s understanding of anything, whether factual or abstract, arises from our manipulations of the external world, by our moving within the world and thus from our sensory-derived experience of it.²²⁹

Similarly neuroscientist György Buzsáki claims that perception is founded on motion and cognition, not motion and cognition founded on perception. He regards activity ‘as not only interwoven with perception but *prior* to perception, prior both in terms of evolution and in terms of initiating processes within and outside the organism that result in the organism’s perceiving.’²³⁰ In relation to the evolutionary claim, he points to some primitive sea animals that are capable only of a rhythmic movement of cilia to bring in nutrients, with no (presumed) perceptual abilities at all.²³¹

And those creatures that have perceptual abilities need to act, after all, even if only to organise and interpret their perceptions. Perception is an active process of going to meet the world – interactive, exploratory – ‘something we *do*.’²³² ‘Seeing’, as Kevin O’Regan & Alva Noë put it, ‘is a way of acting. It is a particular way of exploring the environment.’²³³ This is another way of saying that attention changes the world.

Cognition, too, in as much as it can be separated from perception, involves movement. By this I do not mean simply that, as Galton first pointed out, we often think in and by acting, though that is an important truth. Nor that we often think better when in motion, as the peripatetic

school of Aristotle believed (especially, from my experience, when driving). On this topic Nietzsche was characteristically expressive:

On ne peut penser et écrire qu'assis [one can think and write only when seated] (G. Flaubert). – Now I've got you, you nihilist! Sitting on your arse is precisely the *sin* against the Holy Ghost. Only those thoughts that come in *walking* have any value.²³⁴

Heidegger, whom George Steiner called an indefatigable walker in unlit places, would have agreed.

Nor is it simply that, when we do think in language, we are using adaptations of the motor system, though there is an evolutionary relationship, memorialised in the neuroanatomy of the brain, between speech and movement of the right hand, and it has even been claimed that syntax derives from ambulation.²³⁵

No, what I am getting at here is best articulated by Schelling, who made the point that every assertion is inseparable from the set of circumstances that gave rise to it. There is no genuine proposition (not even, presumably, this one), he asserted, that has universal validity, such that it could be separated from what he calls the movement (*die Bewegung*) – the active engagement with the world – out of which it arises: 'Movement', he says, 'is the essence of knowledge; take away this vital element, and it dies like fruit stripped from the living tree.'²³⁶

Emotion, too, very clearly implies motion. The very word tells us that; but every emotion we experience is founded on a concern or care for some aspect of the world, implying a tendency towards action of some kind. The capacity to move and be moved by others may be fundamental to our conscious being.²³⁷ James Prescott was surely right to think that emotional development depended on movement. Ethics, the experience of moral values, quite clearly implies motion, too, for such values are similarly rooted in active dispositions towards others and the world at large, eventuating in actions, and inevitably tied to emotions. Just to have a body at all, according to Merleau-Ponty, implies motion: 'My body', he says, 'appears to me as an attitude directed towards a certain existing or possible task'.²³⁸ James sums it up well: 'The fact is that there is no sort of

consciousness whatever, be it sensation, feeling, or idea, which does not directly and of itself tend to discharge into some motor effect.’^{[239](#)}

THE ONTOLOGY OF MOTION

‘Change, flux, or becoming is the Absolute’, wrote the Indian philosopher Balbir Singh. ‘What we ordinarily call a thing is itself a process, a ceaseless coming to be and passing away.’²⁴⁰ Is it in fact possible that all ‘bodies’ – animate and otherwise – depend for their nature on motion?

We say that movement is composed of points, but it comprises, in addition, the obscure and mysterious passage from one position to the next. As if the obscurity was not due entirely to the fact that we have supposed immobility to be clearer than mobility and rest anterior to movement! As if the mystery did not follow entirely from our attempting to pass from stoppages to movement by way of addition, which is impossible, when it is so easy to pass, by simple diminution, from movement to the slackening of movement, and so to immobility!²⁴¹

I quoted Schelling just now on the relation between motion and thought. But his insight into their inseparability went further and deeper. At a second level, our knowledge of anything is embedded in movement since, as Fichte too had seen, consciousness is not a fact, or a thing – but an *act*. It is not just that it is a flowing movement, as James saw: it is that movement unites me with the world. Motion is intrinsic to the betweenness, and the directedness, of consciousness itself.²⁴² Consciousness is always consciousness *of* something, reaching out and going to meet something beyond the self; not a self-enclosed Cartesian theatrical display, but a reverberative process, already aimed towards the real, living world – *out of which it also comes*. Creation of other is also creation of self; knowledge of other is also knowledge of self. And in consciousness Nature, according to Schelling, is coming to create and to know itself – in more conventional terms one might say both as ‘subject’ and as ‘object’, except that in this very process that duality of subject and object reveals itself to be false, and comes to be transcended.

Movement then is not only implied in each and every aspect of mental life, as we have seen, but in the body and in consciousness. It is essential to

Nature, both animate and inanimate – to all existing things from waves and particles onwards. Schelling, unlike Fichte, however, did not see consciousness as the ground of everything that exists: that role was occupied in his philosophical system by Nature, out of which consciousness arose and from which it was inseparable. Nature herself, existence itself, was, according to Schelling, motion. ‘*Being itself* = absolute activity’, he wrote in the opening pages of his *First Outline of a System of the Philosophy of Nature*.²⁴³

If we accept that being itself is motion, immobility becomes merely a fictional representation imposed by the mind for the purposes of calculation, as Bergson realised: ‘there never is real immobility, if we understand by that an absence of movement. Movement is reality itself.’²⁴⁴ Here again Bergson seems to share an insight, not just with Schelling, but with Leibniz. Thus Bergson says:

How could the moving object *be* in a point of its trajectory passage? It *passes through*, or in other terms, it *could be there*. It would be there if it stopped; but if it should stop there, it would no longer be the same movement we were dealing with ...²⁴⁵

Compare Leibniz: ‘Whatever moves is never in one place, not even in an infinitesimal instant’.²⁴⁶ This is a version of the point that Zeno made in the Paradox of the Arrow, but with the opposite conclusion: not that motion cannot exist, but that a dimensionless point or instant is a mental fiction. Something moves, says Hegel, in a similar vein,

not because at one moment it is here and at another there, but because at one and the same moment it is here and not here, because in this ‘here’, it at once is and is not. The ancient dialecticians must be granted the contradictions that they pointed out in motion; but it does not follow that therefore there is no motion, but on the contrary, that motion is *existent* contradiction itself.²⁴⁷

This was more than a hundred years before Heisenberg. An entity, Bergson would say, is never in a point in space, it is only in a movement. In fact it only *is* a movement. Could motion, then, be said to be in some sense

foundational? Like time and space, motion cannot be derived from anything else. You can never get from stasis to motion, as Aristotle was obliged ruefully to recognise. You have to start with motion itself. It is in that sense foundational, in that it cannot be derived. But does it form the foundation, ontologically speaking, for other aspects of experience?

Space and time are not just abstract concepts, but aspects of lived experience. They are not things, even disembodied things. Nowadays in the West they are almost always replaced, as soon as mentioned – so lightning fast that we can scarcely be aware of it – by abstractions; and abstractions are always secondary developments from lived experience. And not just for the layman: ‘the method of freezing time has worked so well that most physicists are unaware that a trick has been played on their understanding of nature’.²⁴⁸ Our education teaches us not just to think of space and time as abstractions, but, because of our tendency to *privilege abstractions*, to see them as primary – and movement as secondary. I suggest that movement is as foundational as space and time. Each requires the other. Space is the *potential* for something to move within it; time is the *potential* for something to change within it.²⁴⁹ Both become actualised in flow. To attempt to negate motion, then, threatens to undermine any means we might have of approaching and understanding reality.

Yet to the left hemisphere rest is the primary state. Rest is, as far as it is concerned, how things *really* are, and motion is something adventitious that is superadded. Its efforts are always directed, as far as possible, towards the eradication of motion. As we have seen, analysis, the forte of the left hemisphere, ultimately yields stasis. ‘The separation of thought and action, theory (*theoria*) and practice, is a fundamental requirement of the form of rationality for which Descartes is arguing’, writes the philosopher DM Levin.²⁵⁰ And with those words I am reminded of how Roland Kuhn’s schizophrenic patient Franz Weber ‘wanted activity of any sort to be replaced by knowledge’.²⁵¹

Analysis wants measurement, and measurement begins the process of immobilisation and fragmentation. Yet it is never quite equal to what it measures. As Claudio Ronchi puts it: ‘Once a unit is given, our mind can conceive of its measurement only through a sequence of contiguous and not overlapping units that cover the object in defect or excess.’²⁵² Analysis also starts its attempts to reconstruct the world from stasis, though motion can, of course, never be reached by aggregation of static elements. ‘Fixed

concepts can be extracted by our thought from the mobile reality’, said Bergson, ‘*but there is no means whatever of reconstituting with the fixity of concepts the mobility of the real.*’²⁵³ And this hemisphere difference is what he was alluding to, unknowingly, when he said: ‘intelligence starts ordinarily from the immobile ... intuition starts from movement’.²⁵⁴ James writes:

you cannot make continuous being out of discontinuities, and your concepts are discontinuous. The stages into which you analyse a change are *states*, the change itself goes on between them. It lies along their intervals, inhabits what your definition fails to gather up, and thus eludes conceptual explanation altogether.²⁵⁵

What this means is that analytic thinking will never be up to the job of providing a complete account of reality, and what it lacks will be hardly trivial, but what is in every sense vital to the project of philosophy.



In Oriental religions and in early Western philosophy, before the time of Plato, we used to know that change is something very deep, not just something that ‘happens to be’ – or worse, happens not to be at all. In 1212, Kamo no Chōmei wrote the poetic meditation which is familiar to generations of Japanese schoolchildren, known as *Hōjōki*, which encapsulates the Buddhist idea of *mujō*, or impermanence:

The flowing river never stops and yet the water never stays the same. Foam floats upon the pools, scattering, re-forming, never lingering long. So it is with man and all his dwelling-places here on earth.²⁵⁶

Shunryū Suzuki reinforced the absolutely foundational nature of this insight:

That everything changes is the basic truth for each existence. No one can deny this truth, and all teaching of Buddhism is condensed within it ... Without realising how to accept this truth you cannot live in this world. Even though you try to escape from it, your effort will be in vain. If you think there is some other way to accept the eternal truth that everything changes, that is your delusion. This is the basic teaching of how to live in this world. Whatever you may feel about it, you have to accept it. [257](#)

Of course if Heraclitus did really say ‘everything flows’, his saying has the advantage over ‘everything changes’ (which it is often understood to mean) in that it says not only that things change, but Bergson-like, there is no succession of things (time slices) involved in change, because they flow, interpenetrating one another – and therefore *remain*. And not only that, but, again Bergson-like, there are not things that flow, but there is just – flow, which manifests as things flowing; it’s the flowing that is the ultimate reality.

SPACE AND MATTER

Something unknown is doing we don't know what – that is what our theory [of the physical world] amounts to.

—Sir Arthur Eddington¹

I do not define ... space ... as being well known to all.

—Sir Isaac Newton²

SINCE EINSTEIN WE SPEAK OF AN ENTITY CALLED SPACETIME. FROM ONE perspective, however, there may not be an entity, or even separate entities, involved at all. I have mentioned his suggestion that we should speak of things being ‘spatially extended’ rather than ‘in space’. Space and time are not containers in which we live, but aspects of being.

‘It is interesting that in some mythologies, Time appears as a god, a mythic *person* of sorts’, observes Jan Zwicky, ‘but, to the best of my knowledge, space is never so represented.’³ Time speaks profoundly to the human condition in a way that space, however fundamental it might be, simply does not. Time is relentless, like another being’s will, where space is pliable and may be fashioned, though not without limits, to our own. Time is emotive; space is bland. Time is always single. ‘I venture to say only one true integer may occur in all of physics’, says physicist David Tong. ‘The laws of physics refer to one dimension of time. Without precisely one dimension of time, physics appears to become inconsistent.’⁴ By contrast

space is multiple: it has between three and 11 or even more dimensions, depending on whose theory you are inclined to embrace. Time is irreversible: space open to endless revision. Time creates and corrodes: space lends (temporary) permanence to what is. Writing, for example, was invented to give permanence in space to the fleetingness of thought. Consciousness exists in time, but not in space.⁵ For elements that are often conflated, their qualities could hardly be more different.

Max Scheler points to the dynamic and living quality of time, compared with the adynamic and comparatively inanimate quality of space. 'Life', he wrote,

is an event or a process. It can only be defined functionally and dynamically. No structural definition is sufficient and there is no way one can grasp its meaning by invoking some spatial arrangement of its parts ... Life is a sort of being, which can only be properly got to grips with by emphasising its coming-to-be ... A spatial arrangement is a pre-requisite of the inorganic. Within living creatures events are not arranged along any spatial dimension, but along temporal.⁶

Yet, despite this, space has the means to be generative: it is the *potential* for motion, and gives rise to form, which is what we see, precipitated out of potential, in space. In the project of differentiation – of species, of individuals and in all the creative flow towards generating new, unique creatures, events and circumstances – space is *required*, otherwise all would collapse into unity.

While time shows us that aspect of reality which is always incomplete, space shows us that aspect of reality which has been achieved. Both have their place. Thus Whitehead:

Apart from space, there is no consummation. Space expresses the halt for attainment. It symbolises the complexity of immediate realisation. It is the fact of accomplishment. Time and space express the universe as including the essence of transition [time] and the success of achievement [space]. The transition is real, and the

achievement is real. The difficulty is for language to express one of them without explaining away the other.⁷

It is possible to see time as the leading edge of a waveform which actualises what we experience out of the potential of space as it moves forward. The question why the arrow of time can't go backwards is a mistake due to the spatialisation of time. You might as well ask why a stream doesn't flow backwards.

WHAT IS FORM?

It is worth distinguishing between structure and form. The word ‘structure’ comes from Latin *struere*, to build, and implies construction: putting parts together to produce an edifice (or a mechanism). ‘Form’, on the other hand, has no such implications and refers to the overall shape, or *Gestalt*, of something that may be constantly changing, even if, indeed, changing in order to stay the same.⁸ Forms are usually evidenced in matter, and matter in forms: no-one has seen matter without form. It is sometimes said that no-one has seen form without matter, but that seems to me wrong: I can see forms of light, and I can see imaginary or abstract forms, with the mind’s eye, or in certain states of mind with the bodily eye. But matter is inconceivable without form. So it seems to me – and here I am in agreement with Plato and Aristotle – that form is more fundamental than matter. This is also, according to Schrödinger what physics confirms:

The habit of everyday language deceives us and seems to require, whenever we hear the word ‘shape’ or ‘form’ pronounced, that it must be the shape or form of *something* ... when you come to the ultimate particles constituting matter ... they are, as it were, pure shape, nothing but shape.⁹

Form is the coming together of an essentially static, receptive potential (space) with an essentially motivating, ‘informing’ energy (force).¹⁰

That receptivity is what Buddhists call emptiness: ‘the very essence of the phenomenon, emptiness, produces form and needs to manifest itself in certain superficial ways’, ie, as the phenomenal and material world we experience.¹¹ Emptiness is the commonest theme underlying the metaphorical expressions of the classic Buddhist text, the Diamond Sutra.¹² *Śūnyatā*, the Sanskrit word translated as emptiness, derives from *śvi*, which denotes hollowness and swelling, as of a womb, or of a seed as it expands.¹³ It is the opposite of emptiness as it is normally understood in the West, namely, a condition of inertia and sterility: rather it is one of limitless, undifferentiated potential.¹⁴ As often, there are parallels in quantum field

theory. Space is never in fact empty: 70% of the entire universe is dark energy, we are told, and 25% dark matter: far greater in extent than all the ‘things’ we could see. Even a vacuum is full of energy fields. Space could be seen as a property of fields of *energy* – fields, therefore, of potential creation. Fields do not need a substance (L *sub-* + *stans*, that which ‘stands under’) in which to exist: space does not ‘carry’ or support the oscillating magnetic fields: they support themselves. As James puts it, ‘the directly apprehended universe needs, in short, no extraneous trans-empirical connective support, but possesses in its own right a concatenated or continuous structure’ – or form, as I would prefer to put it.¹⁵

The forms that are found in Nature are the result of motion, and embodied movement, not stasis; similarly, movements found in Nature enact forms, not structures. The great biologist and mathematician D’Arcy Thompson saw form as inseparable from the energy involved in the processes which generate it.¹⁶ We have already seen that many flows in Nature are vortices, and that self-organising and self-promulgating patterns of complexity and beauty – fractals, spirals, *l**̃*-formations – are everywhere in the world, both organic and inorganic. The spiral is an expression of dynamism (DNA is the ‘betweenness’ of two spirals), where the circle is an expression of stasis.¹⁷ In the spiral, the end point of each turn does not quite match the beginning. And so we have, suddenly, because of this symmetry-breaking ‘mis-step’, something that is mobile, three-dimensional, endlessly generative, while never being wholly predictable (because always moving onward into a new realm of space, not residing always in the old one). It replaces something atemporal, two-dimensional, repetitive, and entirely regular, namely a circle. All the same, viewed down the axis of the spiral it still has the eternally unchanging quality of the circle – particle-like: though viewed from the side it has an oscillatory or vibratory movement, wave-like, changing, progressing and alive. Fractals, though quite different in nature, have this in common with spirals, that they generate *difference that is also* a kind of *sameness*.

Intellectual life also has more of the spiral than the straight line or the circle about it. I have pointed out that many important truths cannot be expressed explicitly or arrived at linearly, but must be, so to speak, taken by stealth. They must be disclosed from a number of different perspectives that converge, rather like following a spiral path around them. This is how the best philosophy, it seems to me, is done, and it is what Donne referred to in

the passage I quoted in the Coda to Part II. Like Blake's ladder that circles its way to Heaven, and thus to spiritual truth, Donne sees truth, both spiritual and intellectual, as being achieved by a path that is spiral-like. Since the Enlightenment this important truth has been neglected.

Galileo said that 'the book [of the universe] is written in mathematical language, and the symbols are triangles, circles and other geometrical figures, without whose help it is impossible to comprehend a single word of it.'¹⁸ I would venture a caveat. The book of the universe is one of pattern: and mathematics is just one way of looking at those patterns. The patterns come first in water, earth, fire, and air: maths comes afterwards, abstracting those patterns. And I'd enter another caveat. The patterns are not just the regular, afore-knowable, patterns of Platonic philosophy— triangles, circles and so on. Many are such that we have no mathematical expressions to describe them. In the words of Whitehead, 'beyond all questions of quantity, there lie questions of pattern, which are essential for the understanding of Nature.'¹⁹

Perhaps Galileo was a little seduced by the exhilarating feeling of being one of a select group of *cognoscenti*. It is, after all, perfectly possible to comprehend more than 'a single word', or even two or three, of the book of the universe without reading the mathematical language at all. The Buddha might stand as an example. Reading the maths adds something both beautiful and very useful, but it is not essential, except to one kind of understanding; and, as with everything, opening one channel of understanding risks closing another. Not being able to see *that* is part of the trouble with the modern West.

THE NATURE OF DEPTH

Let me consider a neglected aspect of space: its depth. In examining the question it is impossible to divorce the literal from the metaphorical. What is it and where do we turn to find it?

Isaiah Berlin wrote that ‘the notion of depth is something with which philosophers seldom deal’:

Nevertheless it is a concept perfectly susceptible to treatment and indeed one of the most important categories we use ... There is no doubt that, although I attempt to describe what ... profundity consists in, as soon as I speak it becomes quite clear that, no matter how long I speak, new chasms open. No matter what I say I always have to leave three dots at the end ... I am forced in my discussion, forced in description, to use language which is in principle, not only today but for ever, inadequate for its purpose ...²⁰

‘New chasms open’: the attempt to clarify depth leads back into the abyss. Discouraging as these words are for those who expect precise answers to deep questions, they pose a challenge: ‘one of the most important categories we use’ is seldom touched on, and yet is ‘perfectly susceptible to treatment’ – though after demonstrating that it is almost impossible to clarify, Berlin gives few clues as to how to set about treating it. So what is depth, and where do we turn to find it? What do we mean when we call a person, a perception, a philosophy, a work of art, or an experience, deep?

What is clear is that depth cannot easily be replaced by other more approachable concepts. When we call something deep, we do not mean that it is just beautiful, important, special, complex or difficult to understand – though it may be any, or all, of those things. In fact the simultaneous sense of something that is charged with ultimate meaning and yet (perhaps for that very reason) hard to put into words, gets close, as Berlin hints.

The history of ‘depth’ since ancient times reveals that the spatial and the spiritual senses of the term have always co-existed, as I will show, so that it is not clear which is literal and which metaphorical. Faced with the

important moments where conventional language breaks down, we turn to metaphor; and the metaphor of depth, *par excellence*, is the sea. As soon as the word ‘deep’ was first used in the English language, over a thousand years ago, it was already a word for the sea itself: the deep. Its counterparts, too, *bathus* (βαθύς) in Greek, and *profundus* in Latin, were from the very start applied to the sea. We call things that defeat our everyday grasp unfathomable. The sea, after all is both creator and destroyer, the source of life and the end of it, the buoyant force, the upholder, and the endless space in which we drown. It is what connects land to land and yet divides each from the other. It changes and yet in changing remains the same.

Etymologically, both *bathus* and *profundus* refer to the lowest part or foundation of whatever it is we know. But they had a range of other implications. They could be applied to a cliff, or mountain – a ‘deep’ cliff or ‘deep’ mountain – of awe-inspiring proportions (the words are importantly connected with the feeling of awe). In other words the idea of depth was not yet limited in direction, and could be measured up, as well as down. And in the third dimension: it also, importantly, referred to the sheer *solidity* of existence in lived space. (Latin *solidus* comes from the same Proto-Indo-European root *sol-* as, for example, the Greek *holos*, whole, and Latin *salvus*, healthy: and of course ‘whole’, ‘healthy’, ‘hale’, and ‘holy’ have common roots). It implied three-dimensional ‘thickness’. Solid bodies are distinguished by their depth, by contrast with their representations, which lack it. In classical Greek, a body of soldiers could be described as so many ranks ‘deep’, impressing in us the sense of standing over against a forceful presence. And then the terms *bathus* and *profundus* were used to describe something ‘far’, remote, almost lost to our knowledge, alerting us to other meanings of deep that we still recognise: deep in the forest, deep in rural France (the phrase ‘*la France profonde*’ rightly has its own Wikipedia page); and by extension, deep in sleep, deep in learning, deep in age.

Time also has this quality of depth that both invites our exploration, and yet signals that we can never fully succeed. Shakespeare’s ‘dark backward and abysm of time’: far distant times are mysterious (‘dark’), a realm which stands ‘in back’ of us somewhere, out of sight – and are unfathomably deep (an ‘abysm’). New chasms open.

The word *bathus* was often used to imply *fertility* and *richness*: ‘deep’ soil and its fruits, fields ‘deep’ with grain, forests ‘deep’ with trees, a woman’s ‘deep’ and luxuriant hair. This is important because when we

speak of depth we never imagine vacuity – indeed we use those words as antonyms. It is a depth that breeds, that has potential, that is generative of something other than the familiar: śūnyatā.

And so there is depth of mind, of wisdom (a use already present in Æschylus, the first great dramatist of Ancient Greece). When we imported the word ‘profound’ from French in the early fourteenth century, it was first used in the metaphorical sense, referring to the mind, since we already had ‘deep’ for the purely physical sense, and it became literal only later; while ‘a deep’, moving in the opposite direction, by the seventeenth century was no longer just the sea, but, according to the OED, could signify a ‘secret, mysterious, unfathomable, or vast’ region of thought, feeling, or being. Depth is also a quality of what we mean by soul, a quality not captured by any of our workaday categories of cognition or emotion. What is deep is profound, awe-full, mysterious, solemn, not to be confined. Such epithets conjure the vast realms of the unconscious mind, that we conventionally think of as lying below our superficial cognition, and in doing so go *deep*.

Conscious thought, according to James and Bergson, is relatively superficial, if practically useful, when compared with intuition and experience. ‘Thought deals ... solely with surfaces’, writes James:

it can name the thickness of reality, but it cannot fathom it, and its insufficiency here is essential and permanent, not temporary ... Instead of being the only adequate knowledge, it is grossly inadequate, and its only superiority is the practical one of enabling us to make short cuts through experience and thereby to save time.²¹

We need the short cuts, but we should not mistake them for the knowledge from experience through which they cut.

We expect deep truths to cohere (even if one of those truths is that coherence is not necessary for truth). We would be very surprised to learn that the deep truths of different cultures did not largely overlap. It is as though our differences might be spread out on the circumference of a sphere, but as we dig deeper we reach aspects of the same core. We speak naturally of spheres, not lines, grids, squares, cubes, or rhomboids, of existence.

Depth, then, may characterise what is tangible, solid and reliable, as foundations are, but also what is indescribable, ineffable, awe-inspiring and

beyond reach, as are the mysteries of a solemn ritual. In doing so it re-enchants the realm of matter. What is deep has abundance, fertility, much packed within, like a great poem or piece of music, though what that is cannot be known in full. It reaches not just beyond our viewpoint, but beyond what we can grasp. To believe that all is within our grasp, is surely a failure of imagination, one that, I contend, leads in turn to a failure to apprehend the deeper meaningfulness of existence.

The question of the nature of depth, like that of the nature of truth, has a peculiar urgency for us now. Is there, in fact, anything left in our world that we would be prepared to describe as not just clever or innovative, but deep? I resonate with Paul Tillich's judgment: 'The decisive element in the predicament of Western man in our period is his loss of the dimension of depth'.²²

A number of critiques of the impact of technology on the Western mind have appeared in recent years: Nicholas Carr's account of 'What the Internet Is Doing to Our Brains' bears the accusation in its title, *The Shallows*. Similar admonitions have been published, among them neuroscientist Susan Greenfield's *Mind Change*, subtitled 'How Digital Technologies Are Leaving Their Mark On Our Brains'. The clever have scoffed and cavilled; the wise have paid (not uncritical) heed. Since the brain is *always* changed by experience, it would indeed be a miracle if something as powerful and unprecedented as digital technology did not leave a substantial mark on our brains. In fact it could not possibly be otherwise. It is therefore not only reasonable, but of vital importance, to ask what the nature of that imprint might be. Some of it might be positive, but not all is likely to be: and it would be worth noticing what is happening, very fast, to human beings. We might be modelling single, selected and simple aspects of our being (however complex-looking in IT terms), and projecting them outwards into the environment so that the feedback loop reinforces in ourselves the impoverished model of ourselves we externalise in computers. And don't forget that the further into this process we allow ourselves to be drawn, the less we can see any more what it is that we are missing.

I believe that we are indeed losing depth, but because of a whole change of heart and mind that has come over us in the last 200 years or so, only part of which can be said to be caused by technology, and of which technology is at least as much an effect as a cause. Technology is one

expression of the desire for power and control over the world, which is of course the primary motivation of the left hemisphere, in which it repudiates the right hemisphere on which we rely for our sense of depth in every sense of the word.

THE PRIMACY OF RELATIONSHIP

In the presence of depth we enter into a relationship with what we see, one that embodies nonetheless, as one might expect, a tension between opposites. This is true of depth in emotion, depth in time, and depth in space. Take the example of spatial depth: on the one hand, unlike a flat, two-dimensional screen which rebuffs our approach and draws attention to itself as an object of observation, depth draws us into the possibility of connexion. On the other hand, and by the very same token, it makes us aware of separation. This together-yet-apartness operates also in the ‘depth’ of time, where, through memory, we are one with, and yet, by definition, sundered from, whatever it is we remember. And so it is with emotional depth: we are one with, and *not* one with, the object of our feelings. Depth is, in other words, the *union* of differentiation and union. An element of uncertainty, of unknowability, of what is other, is always present in depth: and that, too, is an important indicator of its being real.



24 Canning [undated].

One of the most important words for space in the Japanese language is *ma*, a word that has no exact English translation. It is, as far as I believe I understand it, something similar to what I would call ‘betweenness’. It refers to both time and space. It suggests the idea of an interval, an interstice; and yet a span, and a relationship. It does not refer to an objective

space, but to a sense of the space in the consciousness of an observer. Without *ma*, nothing can fulfil itself. It also, like *śūnyatā*, suggests the generative potential of space, a potential place where something can come into being: ‘*ma* is filled with nothing but energy and feeling.’²³ It is written with the ideograms for a door and the sun, so might be thought of as the crack through which the light gets in. Of it, the influential graphic designer Alan Fletcher writes:

Mallarmé conceived poems with absences as well as words. Ralph Richardson asserted that acting lay in pauses ... Isaac Stern described music as ‘that little bit between each note – silences which give the form’. Franz Kafka warned that ‘the Sirens have a still more fatal weapon than their song, namely their silence ... Someone might possibly have escaped from their singing; but from their silence, certainly never’... The Japanese have a word (*ma*) for this interval which gives shape to the whole. In the West we have neither word nor term. A serious omission.²⁴

In Japanese the word for a fool, *manuke*, means someone lacking in *ma*, which, given that we Westerners haven’t got *ma* at all, ought to bring us up short. *Ma* is the depth that is expressed by reticence, silence, what is *not* said; it is a space that is the opposite of empty. This is reminiscent of the lines from the *Tao Te Ching*:

Thirty spokes meet in the hub,
but the empty space between them is the essence of the
wheel.

Pots are formed from clay,
but the empty space within it
is the essence of the pot.

Walls with windows and doors form the house, but the
empty space within it
is the essence of the home.²⁵

The ways in which distinct (but never wholly separate) entities are related are more important than the *relata*, the things so related. That applies whether the relation be one of conjunction or disjunction. Indeed, though this may sound paradoxical at first, I believe the relations are primary, and form the bedrock of our experience, out of which emerge, secondarily, the elements that we *retrospectively* see as ‘things related’. When I say retrospectively, I do not mean that we have to actively reflect on experience at some future point to see this, but that it comes about through the left hemisphere’s re-presentational gaze. Here I am again with the mathematician Poincaré, who, while stressing that science must tell us *something* of reality, insisted that ‘the things themselves are not what it can reach, as the naïve dogmatists think, but only the relations between things. Outside of these relations *there is no knowable reality*.’²⁶

One way of making sense of this is that relationships must be primary, since entities *become what they are only through their situation in the context of multiple relations*. All entities are essentially interconnected, changing, flowing, ungraspable: their thingness is an emergent property of the field. ‘It isn’t the atoms and molecules that are at the hard core of reality’, writes biophysicist Don Mikulecky; ‘it is the relations between them and the relations between them and things called processes which are at the core of the real world.’²⁷

As I was nearly finished writing this book, which was originally to have been called *There Are No Things* (a title which I eventually rejected because of its unfortunate suggestion that I might subscribe to a nihilistic brand of postmodernism) a physicist interested in my work sent me a piece by his colleague Piet Hut, Professor of Astrophysics at the Institute for Advanced Study, Princeton, called: ‘There are no things’. Most strikingly it expresses in terms of quantum fields my long-held philosophical belief that relations are prior to *relata*, one for which I had despaired of finding a sympathetic hearing. Hut quotes his colleague David Mermin’s maxim: ‘correlations have physical reality; that which they correlate does not.’²⁸ He comments: ‘the verbs are verbing all by themselves without a need to introduce nouns ... properties are all there is. Indeed: there are no things.’²⁹ And Mermin names Niels Bohr, Lee Smolin, Carlo Rovelli and Gyula Bene as adopting a similar position.³⁰ One consequence of this is that, according to Mermin, ‘if physical reality consists only of correlations, nothing physically real ever changes *discontinuously*.’³¹

SPACE AND THE HEMISPHERES

As in the case of time, the right hemisphere has the advantage in comprehending depth in space.³² I have reviewed the aspects of visual perception at which the right hemisphere is superior, and many of the remarkable spatial distortions that ensue on right hemisphere injury earlier, and so I will keep here to a few essentials.

In general, spatial organisation is right hemisphere-based, specifically involving the right hippocampus.³³ EEG activity in the right neocortex suggests it plays a special role in spatial navigation.³⁴ ‘Left-lateralized spatial memory strategies, relying on serial order, are not efficient if not accompanied by right-brain spatial functions’: note that the left hemisphere produces, as with time, ‘serial order’ of points, places or slices, so that the ‘right brain is crucial for mental rotations, necessary for spatial updating’.³⁵ Spatial integration across sensory modalities, large-scale spatial orientation, spatial memory and navigation skills are all preponderantly reliant on the right, not left, temporoparietal cortex.³⁶ Subjects with right hemisphere damage, with or without neglect, do very poorly at following a map, which involves converting abstract information into an understanding of the experienced three-dimensional world: those with left hemisphere damage, by contrast, reveal no deficit.³⁷ Navigation efficiency and spatial memory can be significantly improved by stimulating the right, but not left, temporal region.³⁸

A distinction has repeatedly been made between the right hemisphere’s capacity to identify the location of something in the depth of space, its ‘coordinates’, so to speak, and the left hemisphere’s strategy of categorising something as ‘above’ or ‘below’ something else.³⁹ The right hemisphere’s organisation of space depends more on this sense of where things *are*, nearer or further ‘from me’ – on depth, in other words.⁴⁰

The left hemisphere has a problem dealing with depth, whether that be depth in space, in time or in emotion.⁴¹ And, as far as spatial transformations go, it is not just that three-dimensional depth is lost and objects appear flattened; they also become more distanced, more generalised, more stylised, less fluid, more symbolic and more geometric. This strange visuo-spatial world is sometimes dramatically obvious after a

right hemisphere stroke. The sense of overall shape, the *Gestalt*, may be lost, reduced to an aggregate of details without form; and with that the vital flow is lost. In general, drawings by the isolated left hemisphere show important characteristics of a virtual, rather than a real world image, or, as we might now say, an ‘icon’, rather than what that icon stands for in the lived world. They become ‘views from nowhere’.⁴²

In keeping with my hypothesis that the left hemisphere is orientated to a theoretical, rather than experiential, world view, the processing of nonsensical and non-real-world images activates preferentially the left hemisphere, unlike most other imagery.⁴³ The left hemisphere is, when compared with the right, at home dealing with distorted, non-realistic, fantastic – ultimately artificial – images.⁴⁴ This may be because they invite analysis by parts, rather than as a whole. But there are independent hints (no more than that) that the left hemisphere may have a positive bias towards whatever is bizarre or non-existent.⁴⁵

Our brains have a remarkable early facility for negotiating space. Elizabeth Spelke, along with her colleagues, introduced blind, or blindfolded, toddlers into a room with objects in four locations. They had the children walk between them on a specific path, then asked them to use another path to move one object to another – putting a toy on a chair, for example. The children proved strikingly adept at the task.⁴⁶ Our spatial sense of the world is both deep and intuitive, and very largely right hemisphere-dependent.⁴⁷

It is only later that we develop abstract ways of representing space. The mathematician Henri Poincaré wrote:

Another frame which we impose on the world is space ... the space our senses could show us differs absolutely from that of the geometer ... We therefore conclude that the first principles of geometry are only conventions; but these conventions are not arbitrary ...⁴⁸

The mapping and measuring of space, as Poincaré points out, though different entirely from our experience of space, is by no means arbitrary, otherwise it would scarcely be of any use. Indeed its very plausibility is why it can be deceitful: like spatialised time, it is easy for us to be taken in

by it. But, as always, its goal is utility, not fidelity. It provides the map, rather than access to the territory. Colin McGinn warns us that

what we need from space, practically speaking, is by no means the same as how space is structured in itself. I suspect that the very depth of embeddedness of space in our cognitive system produces in us the illusion that we understand it much better than we do.^{[49](#)}

SCHIZOPHRENIA AND THE APPRECIATION OF SPACE

In Chapter 9 I spoke about the spatial distortions that commonly occur in schizophrenia, and which closely parallel those found in right hemisphere dysfunction. One patient describes the external world as ‘like a two-dimensional transparency, something like an architect’s drawing or plan’.⁵⁰ The loss of spatial depth spontaneously reported by schizophrenic subjects is corroborated by laboratory research.⁵¹ The following quotation from one of Chapman’s schizophrenic patients brings out the relationship between three elements, each associated with right hemisphere deficit states – lack of depth, piecemeal composition of both space and motion, and impaired judgment of distance:

I see things flat ... It’s as if there were a wall there and I would walk into it. There’s no depth, but if I take time to look at things I can pick out the pieces like a jigsaw puzzle ... Moving is like a motion picture ... If you run you receive the signals at a faster rate. The picture I see is literally made up of hundreds of pieces. Until I see into things I don’t know what distance they are away.⁵²

Merleau-Ponty pointed to the fact that only something that has depth can have different facets, or aspects in the true sense. Without depth all it has is *parts* or *pieces*.⁵³

The reducing of space to something without depth is expressed by one schizophrenic subject: ‘Space oppresses me – for me it is no longer there’. He describes his experience in such a way as to compare what has happened to space with what has happened to time: ‘the lack of the feeling for space, the *pokiness of the moment*’.⁵⁴ For Tatossian’s patient Hélène Jacob, there is a collapse of space, of the near and the far, both being equal.⁵⁵ The world is like a canvas, and only things painted on it can lend a degree of reality to space, since ‘space that is materially empty is totally empty, empty of being. Thus to her the sea seems like a sort of hole in the “canvas of the world”’.⁵⁶

The sea – the *deep* – has become merely a hole, a nothing.

The effect of non-differentiation – near is far and far is near, small is large and large is small – is that ‘no space’ can equally be read as ‘all space’. These veerings between extremes come from the loss of betweenness, a loss in which everything and nothing, omnipotence and impotence, coincide. It is only relationships that can give real meaning to these terms. Jaspers notes the frequency of descriptions of infinite space by schizophrenic subjects, quoting one who said:

Space seemed to stretch and go on into infinity, completely empty. I felt lost, abandoned to the infinities of space ... it seemed the complement of my own emptiness ... the old physical space seemed to be apart from this space, like a phantom.⁵⁷

The ‘old physical space’ was something quite other than this space, which is ‘completely empty’. Another patient says:

In my mind’s eye I thought I saw below the pale blue evening sky a black sky of horrible intensity. Everything became limitless, engulfing ... I knew that the autumn landscape was pervaded by a second space, so fine, so invisible, though it was dark, empty and ghastly. Sometimes one space seemed to move, sometimes both got mixed up...’⁵⁸

Whether limitless or empty, this space lacks depth.

The collapse of spatial planes destroys normal boundaries. A patient complains:

When I look in a mirror, I no longer know if I’m seeing myself there in the mirror, or if it’s that I’m in the mirror, seeing myself here. I’m standing between two mirrors, so that an endless series of ‘seeing myself’ results, which mystifies me. [NB: here as elsewhere lack of boundaries leads to an infinite series.] If I see another person in the mirror, I’m incapable of distinguishing him from myself. Or worse still, the very difference between myself and another real person is lost. When I’m watching TV, I no longer know if it’s me speaking, there on the box, or I’m the one here, hearing what’s spoken. I no

longer know if the inside is turned out, or the outside turned in. It's as if the foundations of my being are destroyed. Might there not be two of me? ⁵⁹

Another abnormal aspect of schizophrenic space perception is spatial dislocation. It has been shown that auditory information about the spatial surroundings is also highly right hemisphere-dependent.⁶⁰ And so it is not surprising that a schizophrenic patient reports:

I have noticed a lot recently that I seem to get a little mixed up about where sounds are coming from. Often I have to check up if someone speaks to me and several times I thought someone was shouting through the window when it was really the wireless at the front of the house.⁶¹

And another:

I've had difficulty in tracing where sounds are coming from although I am not deaf. If the wireless is on, for example, I know the wireless is there but sometimes I feel that the sounds are coming from behind my back.⁶²

Thus it is that perceptual distortions in space feed paranoid beliefs, and paranoid states lead to perceptual distortions of space. Schizophrenia, as we have seen, as well as autism, obsessive-compulsive disorder and anorexia, are all characterised by an essential preference for stasis and sameness over motion and change.

Morbid symmetry

Before leaving schizophrenia and what it might tell us about right hemisphere dysfunction, a word about an important concept that we would normally think of as purely spatial, but has another meaning in physics: symmetry. In mathematics and physics, the term refers not just to spatial symmetry about an axis, but to any procedure which one can perform on an

object and leave it unchanged. It also signifies independence from contingency – in other words, universality: if a law obeys symmetry, it is universally applicable. All these meanings ally it with the realm of stasis, of universals, of simple, ideal forms: the left hemisphere. Newtonian mechanics are conventionally said to obey symmetry. The word means ‘equal measure’ (Greek *sym-* + *metron*) and, outside of physics and maths, equal measure can mean two different things: identity (that is to say, unison), simplicity, predictability; or harmony, the coming together of disparate elements in a new balanced whole.

As schizophrenic subjects are attracted to immobility, so they can become obsessed with symmetry. I have spoken about the ‘morbid geometrism’ displayed by many schizophrenic subjects. One aspect of this is an excessive need for symmetry. Schizophrenics deal with regular and symmetrical stimuli more easily than ones with complex or asymmetrical patterns: it is the meaning of symmetry as simplicity, predictability, not that of harmony of disparate elements, that is alluring here.⁶³ Minkowski writes of one schizophrenic patient that a ‘mania for symmetry’ took hold of him.⁶⁴ In Chapter 9 we heard of another of Minkowski’s patients, that ‘life has no regularity or symmetry, and for that reason I manufacture my own reality.’⁶⁵ It may be for similar reasons that autistic subjects, obsessive-compulsive subjects, and subjects with anorexia nervosa (a condition which has some overlapping symptoms with each of the other syndromes) also have an abnormally elevated preference for symmetrical patterns,⁶⁶ which is thought to be because such patterns are more readily graspable, and involve less complex transitioning between part and whole. Strikingly one sufferer from anorexia nervosa refers to ‘the horrid soft place of inner *asymmetry* for which there are many vile words: gut, viscera, abdomen’.⁶⁷ It is of particular interest that, when obsessive-compulsive and anorexic patients are stressed by being shown pictures of messy rooms or asymmetrical arrays, areas of the right hemisphere that become active in normal subjects are hypoactive in patients.⁶⁸

In my discussing of time and schizophrenia, I emphasised that changes in the depth perception of time affect the experienced world as a whole: the consequences go well beyond the obviously temporal. Similarly when there are changes in the depth perception of space, the consequences affect the quality of experience as a whole and in ways one might not immediately have anticipated.

LOSS OF SPATIAL DEPTH BRINGS LOSS OF LIFE

Insight into the effects associated with altered depth perception comes from a series of experiments in which it was suggested to hypnotic subjects that they experienced either intensification or attenuation of depth. The trials were carried out in young men, verified hypnotic-suggestive subjects, who were free from mental illness. The advantage of this kind of study is that it is naturalistic and the resulting paper reports the actual experiences of the subjects, often verbatim.

When primed that the dimension of depth was ‘gone’, one subject ‘at once showed marked schizophreniform behaviour with catatonic features.’⁶⁹ Another reported that ‘colours, shapes, and sounds all seemed less intense. He reported a loss of sensitivity to touch. He became bored, withdrawn, and hostile ... [and] felt that his environment had become alien and the people around him dehumanized.’⁷⁰ The experimenters comment that ‘the *no depth* condition seems accompanied by a general dulling of perceptual experience. The crucial variable here in determining the schizophreniform response seems to be an increased insubstantiality [lack of *solidity*] of all objects in the environment, including the self.’⁷¹

By contrast,

when the dimension of depth was expanded, a psychedelic state resulted similar to that described by Huxley in *The Doors of Perception*. Lines seemed sharper, colors intensified, everything seemed to have a place and to be in its place, and to be aesthetically satisfying. The hand of God was manifest in an ordered world ... Colours seemed intensified, lines more distinct, and sounds crisper.⁷²

One subject, primed with the suggestion of expanded depth, reported that ‘riding in a car was like taking a wonderfully exhilarating roller coaster ride to everywhere. The landscape was at once a gargantuan formal garden and a wilderness of irrepressible joyous space. Even now, I feel dumb-struck and preposterous in trying to describe this perceptual miracle which has somehow been given me.’⁷³ The experimenters report that ‘the usual

perception of objects in the environment as things in themselves, independent of their surroundings, seems replaced by a perception of objects as being in *interaction with* their surroundings and with the *active* properties of the space around them.’⁷⁴ In other words the world showed itself to be resonant.

The ‘lack of depth’ condition, then, produces schizophreniform features in a normal subject: hostility, a sense of alienation, and boredom, coupled with a dulling of perception, and a sense of reality as insubstantial. Meanwhile the ‘increased depth’ condition produces a sense of oneness with things, vividness of perception, a sense of awe, and, a sense, not of isolated objects, but of things ‘in interaction with one another and their surroundings’. We know that when the right hemisphere is suppressed, so is the sense of depth; here, when the sense of depth is suppressed, it is as if so were the right hemisphere.

MODERNISM, DEPTH AND THE LEFT HEMISPHERE

I will be coming to the physics of space very shortly, but following the discussion of schizophrenia and space it's worth considering briefly the parallels once again between schizophrenia and modernism.⁷⁵

In his essay on 'The thing', Heidegger writes of modernity, again confirming its similarities to schizophrenia:

What is happening here when, as a result of the abolition of great distances, everything is equally far and equally near? What is this uniformity in which everything is neither far nor near – is, as it were, without distance? Everything gets lumped together into uniform distancelessness. How? Is not this merging of everything into the distanceless more unearthly than everything bursting apart?

⁷⁶

Although we are taught that perspective in painting was first adopted by Giotto, and first demonstrated by Brunelleschi in 1415, it was known to both the Greeks and Romans, and that knowledge was subsequently lost in the Dark Ages and had to be rediscovered.⁷⁷ Harmony in music is the equivalent aurally of spatial depth: it is interesting that both harmony and perspective came in with the early Renaissance and departed in the twentieth century.

Modernist painting is notable for its insistence on the flatness of the canvas. Clement Greenberg described the flatness of modern painting as the goal of its progression. He argued that the essential and unique element in Modernist painting is its flatness: 'the Cubist counter-revolution eventuated in a kind of painting flatter than anything in Western art since before Giotto and Cimabue – so flat indeed that it could hardly contain recognizable images.'⁷⁸

Lack of depth is a key to understanding modernism more generally. In a strange way, the art, literature and thought of the period takes a perverse pride in the avoidance of depth, proffering in its place a knowing celebration of shallowness. Sophisticated as she is, Elfriede Jelinek was nonetheless expressing, whether she was aware of it or not, a problem at the

core of modern culture when she published her manifesto, 'I want to be shallow'. In theatre, the effect of reality is achieved through great artifice: without it, its productions seem merely artificial. 'The machinery, in other words, is hidden', as Jelinek writes. The actor produces 'nuances of expression'. By contrast, Jelinek continues,

I prefer not to have anything on stage that smacks of this sacred bringing to life of something divine ... nobody should ever be able to say of them that something quite different is going on inside of them, something that one can read only indirectly on their faces or their bodies ... Perhaps I just want to exhibit activities which one can perform as a presentation of something, but without any higher meaning ... A fashion show, because on that occasion one could also send out the clothes by themselves. Get rid of human beings who could fabricate a systematic relationship to some invented character! Like clothes, you hear me? ... But now to our collaborators: How can we remove these dirty marks, these actors, from the theatre, so that they won't pour themselves from their zip-lock packages all over us? I mean: that they won't overwhelm us with their fluids! ... Let's simply remove them from the inventory of our life! Let's flatten them out into celluloid! ... They drop out of our body perception and turn into *surfaces* that move before our eyes ... ⁷⁹

The fastidious turning away from the messiness of bodily existence, and the inebriated embracing of the abstract left hemisphere representational world, flattened, as Jelinek puts it, into celluloid, makes her manifesto the quintessence of a certain aspect of modernism. In its sophisticated way, modernism, only half mockingly, embraces an aspect of popular modern culture: its unabashed superficiality.

All is not what it seems here, though. One driving force behind the emphasis on surfaces has, since Nietzsche, been an *affirmation* of phenomenal experience, as against the view that phenomena merely obscure an ideal Kantian 'reality' hidden behind them. The message seems to be, what you see is what you get, and not another thing. And yet any resultant cultivation of superficiality seems no more revealing, indeed less so, than what it replaces.

The problem here is the fruitless switching between the two parts of a false dichotomy. The structure of this problem is similar to that of the subjective/objective dilemma. The distinction we should make in contemplating that dilemma is not between subjective, on the one hand, and objective, on the other, but between the view that subjective and objective are two opposed entities, on the one hand, and the view that they form a continuous dipole (like the magnet), on the other. They are distinct, but not at war; not discordant, but concordant. The more subjective view is not something we must (even if we could) abandon, but by means of which we are enabled to see beyond it to what we call a more objective view. In the case before us here, the distinction is not between the surface, on the one hand, and the depth, on the other, but between the view that artificially separates surface from depth, on the one hand (seeing surface as opaque and obscuring a reality that lies beyond), and that which takes the surface as what one sees *into* in order to find the depth, lying just where it is, in full view: there is no discernible *line* between surface and depth.

This latter view is what I call semi-transparency, or translucency, and in brief I believe it helps clarify many mistaken dichotomies. Thus we see the infinite not by turning away from the finite, but by looking *into* it: a looking-into in which the finite is not just a means to the ends of infinitude – hence I say *semi*-transparency, because the finite is precious in its own right, and worthy of the eye's delay as it passes through.

We see the general not by turning away from the particular, but by looking intently at it so as to see *into* it, whereby the value of the particular is not in any way negated, but taken up (*aufgehoben*) into something greater beyond. Similarly, I suggest, we find the soul not by turning away from the body, but by embracing it in a way that spiritualises the body; and we find the sacred not by turning away from the world, but by embracing it, in a move that sanctifies matter. The soul is both in and transcends the body, as a poem is in and yet transcends mere language, a melody in, yet transcends, mere sound, a painting in, yet transcends, the merely frescoed wall.⁸⁰

The left hemisphere is 'either/or' in its persuasion, the right hemisphere 'both/and'. Thus the apparently paradoxical way in which what language and the left hemisphere set up as opposites nonetheless cohere and enrich one another is something the right hemisphere is more capable of accepting. Which in turn is why we need the take of both hemispheres, but for the right hemisphere to be the master of both.

Apart from loss of depth, there are a range of other stylistic features of twentieth-century art that mimic right hemisphere dysfunction. I wrote about this in *The Master and his Emissary*, and referred to cubism, pointillism, surrealism and collage techniques, amongst others.^{[81](#)} I therefore recognised this in a recent examination of spatial distortions following right hemisphere damage:

Interestingly, the distortions created by painters of the Cubism period, characterized by an asymmetry of objects and body representations, a specific enlargement or reduction of parts of space, or even by complex distortions of 3D space are analogous to those classically reported in right-brain-damaged patients (unilateral spatial neglect, hyperschematia, constructional apraxia).^{[82](#)}

ASPECTS OF THE PHYSICS OF SPACE

Here I want to shift from the phenomenology of space, and its metaphysics, to the physics. Physics and metaphysics are always implied in one another.

I have no pretensions to understand the complexities of modern physics. Reassuringly, even those – perhaps particularly those – who, unlike me, have spent years studying them make clear that neither they nor anyone else really understand the various paradoxical models that contend for a place in our understanding of the fundamentals of the physical world, and that a belief that you do understand them is more or less a guarantee that you don't. But where they say that from experience, I say it out of sheer ignorance. In what follows, I have therefore depended on the more accessible accounts given by a number of physicists, among them David Tong, Michael Green, Carlo Rovelli, Henry Stapp, Jim Al-Khalili, Brian Greene, Rodney Brooks and Marcelo Gleiser. It goes without saying that any misunderstandings are my own.

It might seem better not to risk saying anything, but I think physics and metaphysics cannot be treated wholly separately without grave losses on both sides – and what are we non-physicists supposed to do about that? Importantly I do not claim to *found* anything on physics: I simply observe occasions on which physics seems to me to have reached conclusions similar to those reached independently from a philosophical and neurological standpoint. It seems to me likely that neurology, philosophy and physics should all be approaching a similarly structured reality, albeit from different paths, and therefore seeing different aspects of the same whole.

So, though I don't mind in the least being told I am mistaken, I will carry on and do my best to summarise very briefly why I think that the discussions in neurology and philosophy that have flowed from the hemisphere hypothesis and filled this book so far, can illuminate, and in turn be illuminated by, certain issues in physics. These issues are:

1. To what extent are the physical foundations of reality knowable?
2. If so, what do they look like? In particular, are they discrete or continuous?

3. What clues do we have about the nature of mass and matter?
4. Is asymmetry built into the foundations of reality?

1. *Are the physical foundations of reality knowable?*

Physics is Pragmatist in its approach to truth. It does not claim to describe reality, but to offer models that work. To quote Bohr: 'There is no quantum world. There is only an abstract quantum physical description. It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature.'⁸³ The models enable us to make predictions with greater or lesser degrees of accuracy. The elements in the model are not observable directly, but are implicit in the effects that we observe within the model.

We can measure no aspect of a particle without in some fashion interacting with it, and that interaction changes the particle's nature. This becomes dramatically obvious at the quantum level: for anything to be literally seen requires the object of our interest to be struck by a photon. That collision alters the system that is observed. With particles smaller than can be seen by light, we may use electromagnetic waves with much smaller wavelength, but such waves have inevitably greater energy, and interfering with a particle with a high energy beam changes the particle more radically. The German theoretical physicist Pascual Jordan went so far as to say: 'Observations not only *disturb* what has to be measured, they *produce* it!' Of the electron, he continued, 'we compel it *to assume a definite position* ... We ourselves produce the results of measurement'.⁸⁴ This is the (by now well-known) observer effect: that by the mere fact of observing a phenomenon we cannot but change that phenomenon, or even, as Jordan suggests, bring it about. Observation, it is thought, collapses what behaves like a wave into what behaves like a particle.

As to precise knowledge, a number of factors operate. The more closely one pins down one measure (such as the position of a particle), the less precise another measurement pertaining to the same particle (such as its momentum) must become – Heisenberg's Uncertainty Principle. It is intrinsically impossible to know the values of all of the properties of the system at the same time. Further, elements of matter are neither isolated nor

certain, but interconnected and probabilistic. David Tong, Professor of Theoretical Physics at Cambridge, draws attention to a further point:

Physical quantities are not integers but real numbers – continuous numbers, with an infinite number of digits after the decimal point. The known laws of physics, *Matrix* fans will be disappointed to learn, have features that no one knows how to simulate on a computer, no matter how many bytes its memory has. Appreciating this aspect of these laws is essential to developing a fully unified theory of physics.⁸⁵

He points to the fact that 40 years of efforts to simulate the Standard Model on a computer have so far failed. ‘To perform such a simulation, one must first take equations expressed in terms of *continuous* quantities and find a *discrete* formulation that is compatible with the bits of information in which computers trade ... It remains one of the most important, yet rarely mentioned, open problems in theoretical physics’.⁸⁶ This suggests not necessarily that the simulation could never be made, but more fascinatingly, that even if it could, it would involve translating the inherently continuous nature of reality into the inherently discrete nature of machine processes – a problem which might or might not prove intractable.

And he continues:

Scientists are not entirely sure what to make of our inability to simulate the Standard Model on a computer. It is difficult to draw strong conclusions from a failure to solve a problem; quite possibly the puzzle is just a very difficult one waiting to be solved with conventional techniques. But aspects of the problem smell deeper than that. The obstacles involved are intimately tied to mathematics of topology and geometry ... [it may be] that the laws of physics are not, at heart, discrete. We are not living inside a computer simulation.

In the attempt to describe quantum reality, ordinary language simply breaks down. As Bohr put it: ‘We must be clear that, when it comes to atoms, language can be used only as in poetry. The poet, too, is not nearly

so concerned with describing facts as with *creating images* and *establishing mental connections*.’⁸⁷ Another twentieth-century physicist (and, incidentally, a logical positivist), Philipp Frank, was of the opinion that ‘even the statements of Newtonian physics cannot really be formulated in common-sense language, but in the relativity and quantum theories the impossibility becomes obvious.’⁸⁸

If reality is such that our knowledge is intrinsically, not accidentally, *incomplete*; if it is intrinsically, not accidentally, *uncertain*; if it is intrinsically inexpressible in everyday language, requiring exceptional, non-denotative, highly metaphoric, ‘poetic’ use of language to get beyond the limits of language; if we must deal not with facts but with connexions; if entities are never wholly separable from other entities; if the process of a knower coming to know is interactive or reverberative, each changing the other – not distanced, inert and owing nothing to the presence, and possibly the nature, of the one who comes to know; and if any attempt to model it reduces what is continuous and moving, to what is static and discrete – if all of this is true, it is clear which hemisphere will be better suited to discerning it. Once more the right hemisphere’s take seems more veridical.

2. *Fields or particles?*

James’s insight was that what he called a pluralistic universe ‘possesses in its own right a concatenated or continuous structure’. Expanding this idea, he wrote that ‘the relations between things, conjunctive as well as disjunctive, are just as much matters of direct particular experience, neither more so nor less so, than the things themselves. The generalized conclusion is that therefore the parts of experience hold together from next to next by relations that are themselves parts of experience.’⁸⁹

A hundred years or more later, what do we know about this insight? A good deal, I submit, that would bear out both his and Bergson’s view of the universe: that it is neither wholly discretised, though discretised enough to generate individuals; nor wholly continuous, though continuous enough to be ultimately unified, and that the discreteness arises secondarily out of the continuity.

‘Physicists routinely teach that the building blocks of nature are discrete particles such as the electron or quark’, writes Tong:

That is a lie. The building blocks of our theories are not particles but fields: continuous, fluidlike objects spread throughout space ... The objects that we call fundamental particles are not fundamental. Instead they are ripples of continuous fields ... Deep down, the theory is not quantum. In systems such as the hydrogen atom, the processes described by the theory mould discreteness from underlying continuity.⁹⁰

‘All particles are waves in a universally distributed continuous shared field that envelops each and all of us: values in the field change with space and time,’ says Tong.⁹¹ Wave and particle are two modes of being of the same field phenomenon: this makes possible the coming together of union and division, of continuity (the wave) with discreteness (the particle) within a single uniting phenomenon (the field). Louis de Broglie proposed that the dipole of wave and particle is universal: everything that moves – which is another way of saying everything – has some aspects of a wave and some aspects of a particle.⁹²

This is where it is useful to think in terms of quantum field theory (QFT). In QFT there are no particles; there are *only* fields.⁹³ But those fields are not the same as classical fields: they can become, emergently, quantised. The quantum of a field is what was conventionally conceptualised as a particle. According to QFT, the continuity of the field is more foundational than the particle-like quantum: the wave-like property of a field collapses into what behaves like a particle, and thus the ‘particle’ is an emergent property of the field. ‘I, among many others’, writes Tong, ‘think that reality is ultimately analogue rather than digital. In this view, the world is a true continuum. No matter how closely you zoom in, you will not find irreducible building blocks.’⁹⁴ In another context he remarked: ‘At a fundamental level is nature discrete or continuous? I see no evidence whatever for discreteness. All the discreteness we see in the world is something which emerges from an underlying continuum ... Quanta are emergent ... they are not built into the heart of Nature.’⁹⁵

Not everyone would agree with Tong, of course – not everyone would agree with any point of view, especially in contemporary physics. But as he points out, such a view has a long pedigree. Maxwell and Faraday were the

first to think in terms of fields. He draws attention to Nobel Prize winner Wilhelm Ostwald, who, 100 years ago,

pointed out that the laws of thermodynamics refer only to continuous quantities such as energy. Similarly, Maxwell's theory of electromagnetism describes electric and magnetic fields as continuous. Max Planck, who would later pioneer quantum mechanics, finished an influential paper in 1882 with the words: 'Despite the great success that the atomic theory has so far enjoyed, ultimately it will have to be abandoned in favour of the assumption of continuous matter.'⁹⁶

More recently, in the 1980s, a 'celebrated theorem' proved that 'it is impossible to discretise the simplest kind of fermion ... We can handle all kinds of hypothetical fermions but not the ones that actually exist.'⁹⁷ Fermions could be considered the 'building blocks of matter': electrons, protons and neutrons are all types of fermion. And yet, according to Tong, they can't be discretised.

Many hold that no theory compares with quantum field theory for the range of phenomena with which it is compatible. For example, quantum mechanics (QM) and relativity are mutually incompatible, something that famously distressed Einstein. But QFT is compatible with relativity, an important point in its favour. According to Rodney Brooks, QFT is

a theory that has produced more precise agreement with experiment than anything before, that encompasses all forces and all matter, that unifies QM and relativity, that resolves Einstein's Enigmas, and that reintroduces common sense into physics ... Common sense is choosing, wherever possible, the simplest, most intuitively satisfying explanation *that is consistent with our observations*. This is not the same thing as accepting intuition blindly ...⁹⁸

I began this chapter with some reflections on reasons for a non-physicist to regret the conflation of space with time. In QFT, says Brooks,

gravity is caused by a force field – not curvature, and ... contrary to popular belief, QFT is compatible with general relativity ... In QFT, space is the same three-dimensional ‘Euclidean’ space that we intuitively believe in, and time is the same time that we intuitively believe in.⁹⁹

In other words QFT does not embrace the idea that spacetime is an entity, the curvature of which causes gravity. At the end of the day, spacetime may not exist. ‘In physics and, more generally, in the natural sciences, space and time are the foundation of all theories’, writes George Musser:

Yet we never see spacetime directly. Rather we infer its existence from our everyday experience ... But the bottom-line lesson of quantum gravity is that not all phenomena neatly fit within spacetime. Physicists will need to find some new foundational structure ...¹⁰⁰

In string theory, which, as mentioned in Chapter 11, is another popular, though not generally accepted, or even clearly defined, theory, the ‘whole collection of apparently disconnected particles are in fact unified in the sense that they correspond to the many ways in which a single object, a string, can vibrate’, according to Michael Green, former Lucasian Professor of Mathematics at Cambridge.¹⁰¹ A string is a single entity in constant motion which, like the vibrating string of a musical instrument, yet has the potential to vibrate at different frequencies – which pleasingly unites continuity and discreteness in the very same event.

It is indisputable that there are phenomena that come in *chunks*. These are what used to be called particles. The trouble is that the term is misleading, conjuring up distinct concrete entities with known co-ordinates in space and time. Philipp Frank wrote that

in quantum theory the term ‘particle’ is employed as a thing which has no precise position and velocity, and so is clearly incompatible with the full common-sense meaning of this word. I once asked Niels Bohr whether it would not be practical to eliminate the term

‘particle’ completely from quantum theory. Bohr agreed that one could do so in the interest of unambiguity.¹⁰²

So, even if there are no particles as such, it is not as if continuity is everything: Tong himself argues not that there are no quanta, but that they are *emergent* from continua. Let us explore that a little further, since one of our metaphysical themes has been the need for the union of discreteness and union – albeit with this asymmetry, that the union is prior ontologically to the discreteness, and embraces it.

Whereas QM posits a world of particles, and its equations give the probability that the particle is at a given point, QFT posits a world of fields, and its equations give the strength of the field at a given point. Frank Wilczek, a theoretical physicist and mathematician who was a Nobel Laureate, and Professor of Physics at MIT, puts it like this: ‘The Core theory, which summarises our best current understanding of fundamental processes, is formulated in terms of quantum fields ... [What we take to be particles] appear as secondary consequences; they are localised disturbances in the primary entities – that is, in quantum fields.’¹⁰³ This is metaphysically familiar from James and Bergson.

Particularly fascinating from our point of view is that quanta may overlap each other, nonetheless each one maintaining its separate identity. The field quantum ‘lives a life and dies a death of its own’, as Brooks puts it. ‘In that sense, *and that sense only*, field quanta resemble particles.’¹⁰⁴ Physicist Art Hobson puts it this way: ‘An electron is nothing like, say, a tiny pea. An electron is simply an energy increment of a spread-out matter field.’¹⁰⁵ Yet the electron is a real quantum of the field, that has an independent existence to a degree: for example, ‘it may be held in place temporarily (or even indefinitely) by the electrical attraction of a nucleus, but given enough energy it is perfectly capable of going off on its own.’¹⁰⁶ In that way, it is more like an event within a temporal and spatial continuum than a thing in time and space: something we can talk about as if discrete, which in a sense it is, yet acknowledging that it is not wholly disjunct from everything else that exists.

Again the need to combine two apparently opposite characteristics, without collapsing them into one or the other; the recognition of continuity and yet of individual entities within the continuity arising from it and

unified by it; the reclamation of events from the realm of thingness; all this forms an exact parallel with the right hemisphere's take, which unites its own fundamental *Gestalt* perception with the left hemisphere's secondary representation in particulate form. Furthermore it is deeply consonant with the worldview of Schelling.

3. What can we know about the nature of mass and matter?

Matter is whatever occupies space and has mass. Or rather 'exists spatially', since space should not be thought of as a container for 'things'. But it must have mass. And what is mass? Fascinatingly, mass is the tendency of an entity to *resist* – changes in course or speed. This should resonate, since, from a purely metaphysical point of view, I have been arguing that, though flow is generative, nothing comes into existence except by means of *resistance* to flow. The recalcitrance of mass gives rise to the possibility of enduring form.

Photons, particles of light, have no mass: when, however, they split into an electron and a positron, matter and antimatter, they lose energy and gain mass. And when an electron and a positron recombine they lose mass once more, which becomes energy again in the form of light. Light gives rise to mass and the material world we see. Without light we could see nothing: without mass there would be nothing to see.¹⁰⁷

Mass is not the same as weight, though weight is another fascinating concept distinct from resistance: the tendency of all bodies to approach one another. On earth it is, of course, the pull exerted by the earth's gravitational field on all material things. Thus it could be said that while mass comes about because of an attachment to – a drive to make cohere and endure – some particular form, weight comes about because of an attraction *between* existing material forms.¹⁰⁸ The first causes a new event to persist, for a while, in the face of instability; the second causes the coming together of what so persists, so that this creative achievement can grow, can realise further potential. Gravity converts a resistant or disjunctive force, namely mass, into a propulsive or conjunctive force, namely weight.

In classical physics mass is a measure of inertia. Similarly in QFT the effect of mass is

to slow down the speed at which a field evolves and propagates, so mass plays the same inertial role in QFT as it does in classical physics. But this is not all that mass does. This same term also causes the field to oscillate, and the greater the mass, the higher the frequency ... the energy of a quantum is represented by oscillations in its field intensity: the more energy, the faster the oscillations.¹⁰⁹

Mass and energy are ‘interpotential’, as the most famous of all equations, $E=mc^2$, proclaims. Increasing mass increases the speed of oscillations, and that in turn increases energy. Might it be legitimate to think of mass as the price paid in energy for making things endure? Or as the way energy manifests in the so-called ‘emptiness’ (more truly the infinite potential) of space, so as to bring about phenomena that have some thickness in space and duration in time? Bohm called matter ‘as it were ... condensed or frozen light’.¹¹⁰

In case my account here seems to privilege physics too much over philosophy, this relationship between matter and consciousness – that matter is continuous with mind, but forms relatively persistent elements in it – was an insight of Peirce’s:

in obedience to the principle, or maxim, of continuity, that we ought to assume things to be continuous as far as we can, it has been urged that we ought to suppose a continuity between the characters of mind and matter, so that matter would be nothing but mind that had such *indurated habits* as to cause it to act with a peculiarly high degree of mechanical regularity, or *routine*.¹¹¹

According to Brooks,

a quantum field may spread over great distances, but it always maintains its separate identity. In QFT, what we call electrons, protons, etc, are really quanta of a field.¹¹²

Not everyone is easily reconciled to this. The physicist Abraham Pais, for example, felt that this was unsatisfactory. ‘In electrodynamics’, he

wrote,

the continuous field appears side-by-side with the material particle as the representative of physical reality. This dualism, though disturbing to any systematic mind, has today not yet disappeared ... the successful physical systems that have been set up since then represent rather a compromise between these two programs, and it is precisely this character of compromise that stamps them as temporary and logically incomplete ... [113](#)

Yet if aesthetics is to be the guide – and one cannot dispute that for many scientists and mathematicians it has proved, historically, a reliable one – for me there is even greater beauty in the idea that reality can appear both discrete and continuous depending on how it is observed; and that nonetheless continuity has ultimate priority. *Pace Pais*, this may be neither an unsatisfactory ‘compromise’, nor an instance of ‘dualism’. Rather it may be a way of describing two aspects of a single event. After all, as we have already heard from Tong, ‘it is impossible to discretise the simplest kind of fermion’, and electrons, protons and neutrons are all fermions. So quanta are in one sense discrete and in another not discrete.

What makes quanta behave like particles is that only one field quantum can occupy a given state at a time (due to the so-called Pauli Exclusion Principle). This immediately imports the necessary degree of discreteness. But what we think of as qualities of ‘solid’ matter, such as mass, charge and energy, are actually, again, properties of fields. ‘Taking the existence of all these transmutations into account, what remains of the old ideas of matter and substance? The answer is *energy*’, writes Pauli. ‘This is the true substance, that which is conserved; only the form in which it appears is changing.’ [114](#)

The true *substance* is energy, which appears in changing forms. This is entirely in keeping with the view that reality is a dynamic, ever-changing, flowing process, not an assemblage of things; a view which is to be found in the wisdom traditions of East and West, and is given in the world as delivered to us by the right hemisphere, and not the left.

Here is Brooks again:

The difference [between fields and particles] lies in how we choose to perceive reality – the picture in our mind – and this difference is immense. A particle is a localised bounded object. It has edges, or perhaps, as some think, it is only a point. A particle exists *in* space and around it is empty space. A field, on the other hand, is something that exists everywhere as a property *of* space. Its intensity may be small, but it is never zero. Even in areas where there are no quanta, there is a small amount of field called the vacuum field. In QFT there is no such thing as empty space. While particles move through space like baseballs, fields are diffuse and spread-out; they exhibit interference and diffraction. Nevertheless, when a spread-out quantum is finally absorbed, it collapses into one location.¹¹⁵

This collapse seems to occur only when ‘measurement’ takes place.¹¹⁶ But, as David Mermin points out, this whole concept of measurement privileges one very limited and specialised kind of interaction – that with a measuring device – over the broad concept of interaction in general. It is ‘interaction [that] produces correlation’, correlation in this context meaning the tendency of two systems to interact so as to produce altered behaviour in each. And he argues that ‘the very much broader concept of correlation ought to replace measurement in a serious formulation of what quantum mechanics is all about.’¹¹⁷ He argues, in fact, that ‘all correlations are real and objective – not just those produced by a measurement’, and that it is micro-interactions that cause the collapse: ‘it is simply a bad habit not to grant micro-micro ... -micro correlations as much objective reality as the traditional emphasis on measurements has granted to micro-macro correlations.’¹¹⁸

This bears on the question of how quantum collapse could have occurred prior to the advent of an ‘observer’. Would it nonetheless have required consciousness within the correlation? That might not be as odd as it seems, since consciousness may be prior, ontologically, to matter. The implications of that I shall leave till the next chapter.

Richard Feynman championed a ‘particle only’ theory of photon and electrons. Pleasingly, in 1949 Freeman Dyson showed that Richard Feynman’s particle diagrams gave the same results as the field theory approach that was championed by Julian Schwinger and Shin’ichirō

Tomonaga. However, according to Wilczek, when Feynman realised his theory was mathematically equivalent to the usual theory, instead of his finding it exhilarating, ‘it crushed his deepest hopes ... he gave up when, as he worked out the mathematics of his version of quantum electrodynamics, he found the fields, introduced for convenience, taking on a life of their own. He told me he lost confidence in his programme of *emptying space*.’¹¹⁹ The fields came to life in a way the particles did not. Space is certainly not empty. As David Bohm wrote:

What we call empty space contains an immense background of energy, and ... matter as we know it is a small, ‘quantized’ wavelike excitation on top of the background, rather like a tiny ripple on a vast sea.¹²⁰

Physicist Robert Oerter writes:

Wave or particle? The answer: both, and neither. You could think of the electron or the photon as a particle, but only if you were willing to let particles behave in the bizarre way described by Feynman: appearing again, interfering with each other and cancelling out. You can also think of it as a field, or wave, but you had to remember that the detector always registers one electron, or none – never half an electron, no matter how much the field has been split up or spread out. In the end, is the field just a calculational tool to tell you where the particle will be, or are the particles just calculational tools to tell you what the field values are? Take your pick.¹²¹

Is there an argument that, importantly, we should *not* take our pick? Might we not need both? At least, let me rephrase that, since it would seem that the word ‘particle’ causes more trouble than it’s worth: we might need both continuity and discreteness together in the one picture. And that seems to be exactly what we have. This is not an unfortunate conclusion whereby we reach a compromise, or can’t yet decide (not enough to go on), or reluctantly accept a ‘dualism’. It is cause for deeply disconcerted awe. It reflects, or constitutes at another level, everything that the philosophy and neurology on which this book is based would lead us to believe about

existence. And it has ramifications well beyond physics into the ontology of the world, both inanimate and animate.

Another marvellous element in this picture is that the fields come with *degrees* of independence. The quantum is as discrete as it gets: a separate, indivisible element, arising in a field, that, for a while, has a distinct existence, as Brooks puts it, ‘living a life and dying a death of its own’. Then there are self-fields. These live a dependent existence, being created by a source to which they are permanently attached. According to Brooks, examples include the electric field around an electron or proton, and the strong and weak fields around a nucleon. And then, universally present at a higher – or lower – level (depending on how you look at it), is the vacuum field:

The equations of quantum field theory do not permit the field strength ever to be zero. Even in regions where there are no quanta or self-fields, there is a background field called the vacuum field. The vacuum field is especially important in the case of the Higgs mechanism.^{[122](#)}

And even in a vacuum there is entanglement. You might think that entanglement depended on the existence of particles, but no. Entanglement is also a matter of *degrees* of independence, *degrees* of cohesion, and it does not concern particles so much as it concerns fields. ‘Even in a vacuum, with no particles around’, writes George Musser in *Nature*, ‘the electromagnetic and other fields are internally entangled. If you measure a field at two different spots, your readings will jiggle in a random but coordinated way ... The big realization of recent years – and one that has crossed old disciplinary boundaries – is that the relevant relations involve quantum entanglement. An extra-powerful type of correlation, intrinsic to quantum mechanics, entanglement seems to be *more primitive than space*.’^{[123](#)}

Nonlocality is, according to Marcelo Gleiser, Professor of Physics at Dartmouth College, ‘an indelible feature of entanglement, and entanglement is an indelible feature of quantum mechanics.’^{[124](#)} Or QFT. It may even be prior, as Musser suggests, to the space in which it is manifest. Nor is it confined to the microscopic level. It has been demonstrated in the

macroscopic realm, in entanglement within diamond crystals,¹²⁵ and has also been demonstrated in biological systems,¹²⁶ as well as between two entities that never co-existed in time.

That was in Chapter 22; and there I reflected that if it makes sense – and I have no idea if it does – to view the interaction that gives rise to the observation of entanglement as a sudden shift in a whole *Gestalt* (right hemisphere take), such as a field, rather than a change in one discrete entity causing a change in another discrete entity sequentially (left hemisphere take), entanglement would no longer require faster than light communication over unlimited distances between particles. Every part of the cosmos would be necessarily connected in some form to every other part. This is, in fact, the import of Bell's theorem. Oddly enough, and beautifully enough, the quest to reduce reality – at last! – to its elementary particles merely returns the searcher to wholeness.

We are too reluctant to let go of thingness. If we think of particles as things, they seem separate and fixed, whereas they are connected and in flux. 'Isolated material particles are abstractions', wrote Niels Bohr, 'their properties being definable and observable only through their interaction with other systems.'¹²⁷ 'We customarily say', wrote David Bohm,

'one elementary particle acts on another', but ... each particle is only an abstraction of a relatively invariant form of movement in the whole field of the universe. So it would be more appropriate to say, 'Elementary particles are on-going movements that are mutually dependent because ultimately they merge and interpenetrate'. However, the same sort of description holds also on the larger-scale level. Thus, instead of saying, 'An observer looks at an object', we can more appropriately say, 'Observation is going on, in an undivided movement involving those abstractions customarily called "the human being" and "the object he is looking at"'.¹²⁸

In other words, as Mermin put it, not so much measurement, perhaps not even observation, but interaction.

Dynamic relationships are prior to static entities. Einstein saw that fields were of primary importance. 'It needed great scientific imagination', he wrote, 'to realise that it is not the charges nor the particles but the *field in*

the space between the charges and the particles that is essential for the description of physical phenomena'.¹²⁹ Once again it is relationships that are more significant than the *relata*. Betweenness is more essential than the 'things' that exhibit it. As Gleiser points out, photons are

massless bundles of pure energy. Physics was thus proposing that something could exist without mass, that things could exist without being material. Since what exists defines physical reality, the new physics suggested that reality could be immaterial. Energy is more fundamental than mass, more essential.¹³⁰

So energy is ontologically prior to matter. To me that makes perfect sense philosophically speaking. Matter is a condensate riding on the sea of energy, as Bohm indicated it was.

Fields may not only precede 'particles' ontologically, they may have done so historically. Immediately (10^{-30} secs) after the Big Bang there were no particles – for those who still recognise particles – but there were already quantum fields. Quantum fields were everywhere in the universe. In a vacuum, again, there can be no particles, but the fields are still there: and they are moving and differentiated (ie, are something like fluctuating, shape-shifting blobs). The Heisenberg Uncertainty Principle dictates that there is never such a thing as stasis: there are always what are called 'quantum vacuum fluctuations' – complex patterns of flow. They are real, measurable, and indispensable. David Tong describes a vacuum as 'the simplest thing we can imagine in the entire universe and it is astonishingly complicated.'¹³¹

What emerges here for me is further confirmation that we need both discreteness and continuity, both the knowable and the unknowable, the graspable and the ungraspable *together*; that the second in each pairing is ontologically prior to the first; and that here, as elsewhere, betweenness is the most important element. In terms of the manner in which the hemispheres deliver the world this means that there are elements delivered by each, but that the take of the right hemisphere must be both foundational and overarching, grounding and fulfilling the process in which what the left hemisphere offers is intermediary.

It also suggests to me that matter is part of the process of creative resistance within the flow that precipitates individual phenomena into existence, for a while.

Bergson saw the way we discretise matter as something that the part of our consciousness devoted to using the world (a perfect description of the left hemisphere) brings about for its own purposes: carrying out ‘the double work of solidification and of division which we effect on the moving continuity of the real in order to obtain there a fulcrum for our action, in order to fix within it starting-points for our operation ...’¹³² He saw it as analogous to the way in which we discretise time – again for our purposes. In realising that this was, nonetheless, neither the only way in which matter can be thought of, nor the most fundamental way in which it can be thought of, since it draws too harsh a distinction between the static and dynamic characteristics of matter, ‘Bergson arrived’, according to philosopher Peter Gunter, ‘at insights closely resembling those of quantum physics.’¹³³ Only Bergson got there first.

If continuity is ontologically prior to discontinuity, and there is a need to understand discontinuity as arising on the background of continuity; if nonetheless each has to be given a place alongside the other without the tension being resolved by the dissolution of one or the other; if both independence and entanglement are matters of degree, rather than absolute; if relationship is prior to *relata*; all this conforms better to the take on the world of the right hemisphere, and will be better understood by it than by the left.

It is the quantum vacuum fluctuations that give rise to inequalities in the cosmic background radiation. And this asymmetry or inequality in the cosmic background radiation was necessary for the universe to come into being at all. Without it, the quantities of matter and antimatter would have ‘cancelled one another out’. According to Gleiser, ‘a universe that began with equal amounts of matter and antimatter would quickly evolve into a void filled mostly with radiation, a world nothing like what we see around us.’¹³⁴ Which leads to the fourth question, the one about the status of asymmetry.

4. Is asymmetry built into the foundations of physical reality?

Already, in the 1870s, Pasteur was writing sentences that would have anguished his Enlightenment forebears. ‘The universe as a whole’, he wrote,

is asymmetrical, and I have come to believe that life, as it is manifest to us, is a function of the asymmetry of the universe ... Without any doubt, I repeat, if the basic principles of life are asymmetrical, it is because asymmetrical forces of the cosmos preside over their unfolding ... Life is dominated by the effects of asymmetrical forces whose enveloping cosmic existence we sense intuitively. I would even say that living species are primordially, in their structure, in their external forms, functions of the cosmic asymmetry.¹³⁵

Before carrying on to look at the asymmetry of the cosmos, let us pause to consider what we mean by symmetry and asymmetry.

We saw that the greater meaning of symmetry is that an operation leaves something unchanged. (Our everyday use of the term is just a special case of that, whereby reflecting an object through 180° leaves it unchanged.) To this extent it is sterile. Asymmetry, by contrast, is generative – in more than one sense. First, asymmetrical operations produce not the same outcome, but something new. Second, even considered in its more everyday sense, asymmetry can be seen as the coming together of two *different* elements on either side of the axis so as to form a new coupling – the object that is asymmetrical. And, third, asymmetry also always implies symmetry – the symmetry that is broken. Asymmetry can be spoken of only where the potential for symmetry exists, but is gainsaid. Not everything that is not symmetrical is asymmetrical (the contents of my car’s glovebox are not asymmetrical, just a mess). Whereas the façade of the Villa Rotonda is deliciously asymmetrical in its apparent symmetry (compare see Plates 23[a] &[b]). It is this simultaneous affirmation, yet denial, of sameness that is so fruitful.

A similar structure can be discerned in another important phenomenon that we have already seen is highly generative: that of metaphor. The metaphor ‘x is a y’ (Churchill was a bulldog) works only if simultaneously ‘x is not a y’ (Churchill was not, actually, a bulldog). What counts is the coming together of an equivalence that is asserted, with one that is denied.

However, though x not being a y is necessary, it is clearly not sufficient: Churchill is also not a bookcase. There must be potential proximity, for the spark, so to speak, to jump the gap. So it is with asymmetry. Metaphor and asymmetry each set up a *tension*, and the energy lies in this tension.

Symmetry is sometimes approximated by living things, which on closer inspection are, however, like the brain, not truly symmetrical, and are constantly changing and moving. They suggest symmetry, yet deny it. Symmetry-breaking, as cell biologists Li and Bowerman put it, is ‘fundamental to every physiological process. In fact, it may be argued that all qualitative cellular transitions and cellular decision-making are forms of symmetry breaking’.¹³⁶ Symmetry-breaking is what makes morphogenesis possible at the single-cell level, or in multicellular structures – and equally importantly, given the important role of motion in all living things, it is essential for generating body axis and direction, and enabling cell motility. Particularly interesting are asymmetric divisions that lead to different cell fates. For instance stem cells are undifferentiated cells that divide both to renew themselves *and* to give rise to more specialised cell types. Many cases exist in which one daughter cell maintains the stem cell characteristic while the other daughter is differentiated.¹³⁷

The golden ratio ϕ (*phi*) 1: ~ 1.618 is asymmetrical, though universally recognised for its beauty.

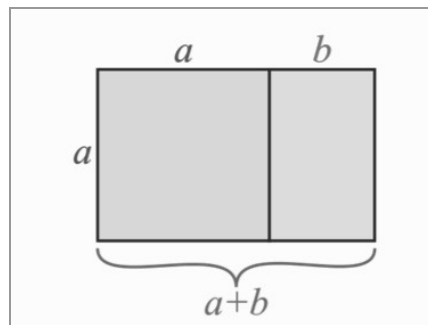


Fig. 55. Golden ratio

It is also generative in a number of respects. Starting from a rectangle whose sides are in the ratio 1: ~ 1.618 , adding a square produces another rectangle, also in the golden ratio, that includes the first. Or, moving in the opposite direction, within any ‘golden rectangle’ a square can be inscribed which produces another golden rectangle. And so *ad infinitum*.

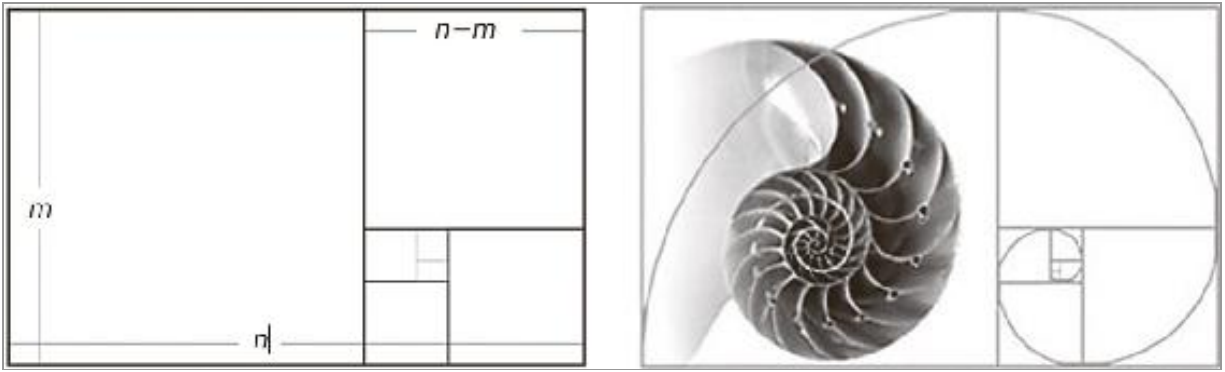


Fig. 56. The relationship between the golden ratio and spiral

This process yields a spiral that is found throughout nature. The ‘golden spiral’ can be seen in, for example, the form of nautilus shells, ammonites, the way hurricanes unfurl, and how spiral nebulae come into being.

Generation means diversification, and yet the ‘golden rectangle’ is simultaneously *unifying*, with the ‘parts’ and the whole always in the same relation. It is a spatial expression of the union of diversification and unification.

Another way to approach ϕ is through the Fibonacci series, which, like the golden ratio, is ubiquitous in Nature. The Fibonacci series is generated by adding each number to its predecessor and making the result the next member of the series, thus: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89 ... The ratio of any member of the series to that which comes immediately before it approximates to the golden ratio (approx 1.618), the approximation getting more and more accurate the further one continues the series, converging on ϕ at infinity. The sequence is generative because it is asymmetrical, open-ended and non-repeating – not symmetrical, closed and repetitive. The spiral disposition of leaves round the stem of a plant in many species is based on the Fibonacci series. When 360, the number of degrees in a full circle, is divided by ϕ , it yields the number of degrees by which neighbouring leaves on the stem are separated, which closes on approximately 222.5° (or 137.5°, when looked at in the opposite direction of rotation, since the numbers add up to 360°). This has the consequence that no leaf ever completely blocks light from another. Even small variations from this ‘golden angle’ cause the property to be lost: varying the angle only from 137.5° to 135° produces a repeating pattern, offering just eight positions in place of the infinitely non-repeating set of positions using

the 'golden angle'. What is particularly intriguing is that this orderly and beautiful way of achieving its end was not purely the fallout of necessity, since other, less elegant solutions could have done a reasonable job of ensuring access to light.¹³⁸ In other words, the omnipresence of the Fibonacci spiral in Nature is not just a matter of utility (though it encompasses that along the way), but of structural principle that is both beautiful and generative.

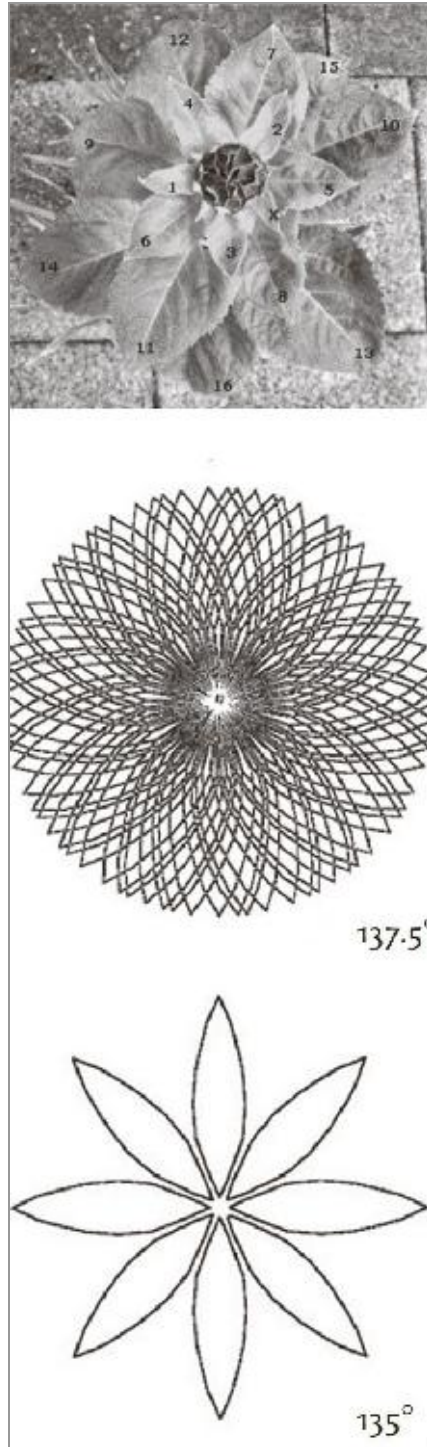


Fig. 57. (Top) Typical Fibonacci distribution of leaves, viewed from above; (centre and bottom) arrangement of leaves resulting from 137.5° compared with 135° separation (photo: © Ron Knott; diagrams from Valladares & Brites 2004)

So it is that the spiralling in pine cones and sunflower discs follows the Fibonacci series (see Plates 22[d] & [e]). The ratio of leftward to rightward spirals in the sunflower obeys the golden ratio, demonstrating exactly 55 leftward spirals and exactly 89 rightward spirals, just as the Fibonacci series dictates: and in the pine cone there are 8 rightwards spirals and 13 leftwards spirals.

Perfect symmetry is an abstraction from reality. Any symmetrical system is highly vulnerable to small inequalities. These then magnify to produce patterns that are less highly symmetrical, yet regular and familiar. Mathematician Ian Stewart gives the example of a flat sandy desert that is highly symmetrical. It takes only a few grains of sand to pile up for some reason and that causes eddies in the wind, which causes more sand to shift and so on – resulting in rhythmically undulating dunes, which have a lesser degree of symmetry. Any part of a perfectly flat surface – the flat desert – could theoretically be slid across itself by any amount and it will not appear changed; but once there are dunes, you'd have to slide the dunes by specific distances, in order to make the new positions of the dunes coincide with the old ones. Breaking symmetries of a certain kind in a similar way leads to irregularly regular ribbed patterns forming – eg, the stripes of a zebra: 'there's a hidden unity: the processes take different physical forms, but the patterns are universal'.¹³⁹ Stewart describes shapes arising 'through a collective process in which the entire pattern jostles around until everything fits together'. In other words the whole is involved in a reverberation, generating its own rhythmic pattern or *Gestalt*, not reductive to 'parts' that are specified by a unidirectional linear process.

Dendritic, or branching form (see Plate 21), such as one sees in frost on a window pane, or in a plant such as a fern, is fractal. There is a main stem, with smaller stems coming off it, and ones smaller still branching off them, and so on. Interestingly, this has to do with symmetry-breaking:

The reason for this kind of shape is that as something grows (ice crystals, plant), as it passes some critical size, the smooth edge becomes unstable and starts to get bumpy. Then the bumps grow, obeying much the same rules, and the process repeats. It's actually another case of symmetry-breaking, analogous to ripples forming in a flat plane, but here the ripples form along a flattish edge. So again we see mathematical unity in very different physical systems.¹⁴⁰

We see unity, yet we also see discreteness. As symmetry is broken, and sand dunes arise, or waves rise up from a flat sea, or a string vibrates, there is *discreteness*, though the surface of land or sea, or the string, is in truth *continuous*. The form produces regularities; and those very regularities are a testimony to there being harmony. This is how unique things come into being at all: otherwise there would be only undifferentiated unison. We are the notes of this polyphonic motet.



With that, let us return to Pasteur and the nature of the cosmos. I remarked that his Enlightenment forebears would have been anguished, because for them asymmetry was an obvious flaw: perfection must be symmetrical. Symmetry is a prominent feature of the architecture, the music, the poetry and even of the prose style of the Age of Reason. The thought that at the core of things there was *asymmetry* would have been enough to trigger a mass outbreak of *felo de se* amongst these decent, orderly folk.

Pasteur's astonishing intuition was that an asymmetry in the very stuff of the universe gave rise to, and was reflected in, the asymmetries of living things. In fact we now know that it is to the asymmetry between electromagnetic and weak forces at low temperatures – they are symmetrical at high temperatures – that we owe the existence of life at all: 'our existence', writes physicist Frank Close, 'is critically dependent on nature having broken symmetry as the universe cooled.'¹⁴¹ Not only are living beings subtly, but manifestly and importantly, asymmetrical in their form – notably, of course, in their neural networks or brains – but the stuff of the cosmos appears to be so, too. Earlier I mentioned that Pasteur's younger contemporary, the physicist Pierre Curie, emphasised that '*it is asymmetry which creates the phenomenon.*' And his intuition, too, has since been shown to be right by subsequent developments within physics.

Tsung-Dao Lee and Yang Chen-Ning were the first to point out that there is no theoretical or experimental basis for the assumption of left-right symmetry in matter; for this they received a Nobel Prize after Chien-Shiung Wu, in 1956, demonstrated violation of parity (absence of left-right symmetry) in the case of the weak interaction.¹⁴² From that point it was established that the universe has handedness, or chirality ('chiral' just

means ‘handed’, from Greek, χείρ, a hand) – that is to say has asymmetrical properties, in the same way that a right-hand glove and a left-hand glove are mirror images of one another, but the images have different properties: you cannot put your right hand into the left-hand glove. Similarly a helix can spiral clockwise or anticlockwise: the two spirals are mirror images, but are not identical and have different properties that are very important in chemistry. Asymmetry and handedness are at the core of reality.

‘A chiral theory is delicate’, writes Tong:

Subtle effects known as anomalies are always threatening to render it inconsistent. Such theories have so far resisted attempts to be modelled on a computer. Yet chirality is not a bug of the Standard Model that might go away in a deeper theory; it is a core feature. At first glance, the Standard Model, based on three interlinking forces [the electromagnetic, weak, and strong interactions], seems to be an arbitrary construction. It is only when thinking about the chiral fermions that its true beauty emerges. It is a perfect jigsaw puzzle, with the three pieces locked together in the only manner possible. The chiral nature of fermions in the Standard Model makes everything fit together.^{[143](#)}

Chirality is everywhere in the cosmos. Radioactivity is chiral; polarised light is chiral; biological molecules are chiral (amino acids are mostly left-handed; sugars right-handed). Left-handed amino acids always give rise to right-handed helical proteins, while right-handed amino acids give rise to left-handed proteins. A mixture of both forms cannot form helices at all. DNA is always a right-handed helix.

Different-handedness, giving rise to two different enantiomers (the ‘left-hand’ and ‘right-hand’ versions) of a molecule, may lead to different phenomena at the human sensory level. For example, the smell of caraway seed flips into the smell of spearmint depending on whether left-handed or right-handed forms of the molecule carvone are involved. Of more consequence is that bioactive molecules, such as many medications, are effective in the case of only one enantiomer; a racemic (50:50) mix may not just be half as effective, but ineffective, as each may tend to interfere with the other.^{[144](#)}

Chirality is a form of fundamental asymmetry: and yet, once again, it invokes a symmetry – mirror symmetry – too. The metaphor of the hand from which it takes its name makes this clear.

It has become apparent from a number of disciplines that dynamic systems depend on what is often expressed as a balance between opposing and complementary forces: between chaos and order, stability and flexibility. As John Polkinghorne puts it,

The physical world as science discerns it, is one in which order and disorder interlace and fertilize each other. The creative interplay of chance (happenstance – the occurrences which are the seeds of novelty) and necessity (lawful regularity which sifts and preserves the novelties thrown up by happenstance) lies at the root of all the fruitful history of the universe ... Physical process is not merely mechanical but it has an inherent openness which makes this a world of true becoming.¹⁴⁵

Complete order would prevent adaptive changes; unconstrained disorder would render self-organisation impossible.¹⁴⁶ The so-called ‘edge of chaos’, where chaos and order are maximally present to one another, is the most fruitful condition of an open system, including the creative potential of the human brain.¹⁴⁷ As Nassim Nicholas Taleb argues in his book *Antifragile*, a certain vulnerability is bound up with the potential to survive: the attempt to do away with it leads to extinction. However, these conjunctions of opposites are not expressive of symmetry, but of the complementarity of elements that are fundamentally asymmetrical. This in turn helps one see that what is needed is both symmetry *and* asymmetry – themselves an asymmetrical pairing – *together*. It is neither the breaking of the symmetry alone, nor (alone) the symmetry that is broken, but the new breaking, in conjunction with the old symmetry, the combination of the two, that is generative.

This generative asymmetry of symmetry and asymmetry is imaged in the way that the sex chromosomes in men and women are asymmetrical, not just different. It is not just that the X and Y chromosomes themselves are an asymmetry, but that the female pair (XX) is symmetrical and the male pair (XY) is asymmetrical. Together they are generative.

The idea of *yin* and *yang*, from which all things arise, has apparent symmetry, but in fact refers, respectively, to the shady side and to the sunny side of a hill, which are not symmetrical. Note that like the poles of the magnet the two sides of a hill cannot be separated, so are not dual. The Japanese equivalent of the *taijitu* symbol, the *inyo* symbol (where *in* = *yin* and *yo* = *yang*) captures more clearly than the *taijitu* the idea of asymmetry combined with symmetry, and at the same time the way in which the energy of *yo* (*yang*) sits within the receptive space of *in* (*yin*). Again the two elements are asymmetrical, as is their positioning in relation to one another (see Plate 22[b]).

In fine, a world which obeyed symmetry could not exist: that would be the left hemisphere fantasy of stasis and timelessness in which there is no place for creation, none for anything new or unknown. If, as theoretical physicist and Nobel Laureate Philip Anderson put it, symmetry means ‘the existence of different viewpoints from which the system appears the same’,¹⁴⁸ then at the heart of physics lies the *difference* of asymmetry. Oddly enough, those two points of view – one in which things are momentarily ‘static’, discrete, at least partly measurable, the other in which they are forever in motion, continuous, and indeterminate – happen to have their counterparts in the modes of consciousness of the two hemispheres of the asymmetrical brain. And in physics they are not symmetrically important, in that one is capable of embracing the other, just as in the case of the brain’s hemispheres.

For that to be more than a coincidence would suggest that either the brain is so made as to reflect the seemingly paradoxical nature of reality, or its structure and function themselves *mould* such a reality, since quantum field theory implies that nothing takes the form that it does wholly independently of consciousness. Each hypothesis is fascinating. But perhaps it is not a matter of having to choose one or the other. To quote Heisenberg: ‘The same organizing forces that have shaped nature in all her forms are also responsible for the structure of our minds.’¹⁴⁹ And brains.

MATTER AND CONSCIOUSNESS

Mental and physical events are, on all hands, admitted to present the strongest contrast in the entire field of being. The chasm which yawns between them is less easily bridged over by the mind than any interval we know.

—William James¹

As we live, we are transmitters of life.

—D.H. Lawrence²

‘THE EXISTENCE OF CONSCIOUSNESS IS BOTH ONE OF THE MOST FAMILIAR and one of the most astounding things about the world’, writes the philosopher Thomas Nagel. ‘No conception of the natural order that does not reveal it as something to be expected can aspire even to the outline of completeness.’³ I agree on both counts. And when we ponder the relationship between matter and consciousness, our thoughts naturally turn to that between brain and mind.

While no-one could possibly dispute the existence of an intimate relationship between brain and mind, the nature of that relationship remains highly disputable. Lucretius was probably the first to argue that, since mental faculties are affected, first by the maturation, and then by the degeneration, of the brain; since alcohol and drugs alter experience; since epilepsy and head injuries alter consciousness; and since memories appear

to be stored in the brain; it follows that mind is dependent on the brain for its existence. This same set of observations lies behind the popular belief that matter gives rise to mind. Now, in the era of brain scanning, in which it might seem that mental events can be visualised through their brain correlates, it is even harder for many to resist such a conclusion.

But do we know that matter can give rise to consciousness? This is merely an assumption. When a TV set malfunctions, it can distort the image or sound it relays in a large number of ways, depending on where in the system the malfunction lies. To an engineer, the nature of the distortion may be a clue to the location of the problem, as the nature of brain pathology is to the neurologist. To an observer from another planet, it might prove impossible to tell that the TV set did not generate, but merely transmitted, its material: pull the plug and the show ceases to exist.

The intimacy of the relationship between two parties has in itself nothing whatever to say about its nature. In the history of the cosmos, matter might give rise to mind, or mind to matter; or each might equally give rise to the other interdependently; or they might run in parallel, perhaps because they are different aspects of some ultimately unified phenomenon. When it comes to the brain, the intimate relation between brain activity and states of mind cannot in itself help distinguish between theories of emission, transmission, and permission as its basis. In other words, the same findings are equally compatible with the brain *emitting* consciousness, *transmitting* consciousness, or *permitting* consciousness. (The latter two options are similar, except that permitting substitutes the idea of a constraint that is creative, fashioning what it allows to come into being, for the merely passive idea of transmission.)

I am going to argue that it is the last of these possibilities – permission – that is the most convincing. The prejudice in favour of the most bizarre – the emissive option – in which consciousness is some form of secretion of the brain, stems from the mistaken belief that, while we may not understand consciousness, we do at least understand matter. But we don't. Even if we did, this would be a quite astonishing conjuring trick, since no-one has the slightest idea of a mechanism by which consciousness could emerge from unconscious matter; in any case matter evanesces as we look at it more closely and turns out to be every bit as inscrutable as consciousness itself. The atom has the curious property that while from a distance it has a blurry self-consistency, it does not become clearer, but more indistinct, as you

zoom in, so that there is less and less to see, until it evades your grasp entirely. And its nature changes by the mere fact of being observed. All this is fine, but it renders impossible the role in which materialists wish to cast matter: the solid mind-independent basis of mind. It is not just brains, but the tiniest particles of matter, we discover, that cannot be considered independent of consciousness. ‘Matter loses solidity more and more under the steady scrutiny of relentless rationality’, as geneticist Mae-Wan Ho notes.⁴

It is clear that we cannot continue to consider matter as straightforward in any way that helps us ground reality in its apparently comforting tangibility. Nearly three-quarters of a century before Murray Gell-Mann and George Zweig discovered the existence of quarks, the philosopher FCS Schiller wrote that ‘the connection of the scientific conception of matter with the hard matter of common experience has become fainter and fainter, as science is compelled to multiply invisible, impalpable and imponderable substances in the “unseen universe”, by which it explains the visible.’⁵

The great neurophysiologist and Nobel Laureate Sir Charles Sherrington reflected on mind and matter:

For myself, what little I know of the how of the one does not, speaking personally, even begin to help me toward the how of the other. The two for all I can do remain refractorily apart. They seem to me disparate; not mutually convertible; untranslatable the one into the other.⁶

Like many a profession of unknowing (all statements about consciousness must be hedged round with such unknowing) this statement carries with it a tincture of positive knowledge. It is already an important perception that the difference lies in the *how*, not the *what*. As soon as we escape the spell of thingness, and see that what we are dealing with is different modes of being, rather than different entities, we have begun to make an inroad into unknowing.

Faced with Sherrington’s feeling of the incommensurateness of mind and matter, which I think we must all, to some extent, share, we have several options. These can be roughly stated as: (1) to deny the existence of consciousness; (2) to deny the existence of matter; (3) to accept that they

each exist but are totally distinct; (4) to assert that they each exist but are the same; or (5) to entertain the possibility that they are distinct phenomena that reflect different aspects of a nonetheless importantly indivisible reality.

WHAT DO WE MEAN BY CONSCIOUSNESS?

When we speak of consciousness, what are we talking about? The word literally means ‘knowing *with*’ (L *con-*, with, + *scientia*, knowledge): it is therefore in essence, not a thing, but a betweenness.

Within that definition it is obvious that consciousness can mean a number of different things in different contexts, and I do not want to spend a lot of time on territory that has been endlessly disputed, and at times even a little clarified, elsewhere.⁷ My aim here is as much as possible to avoid misunderstandings, rather than to provide definitions of what is intrinsically not amenable to definition; and I do not want to set up sharp distinctions where such distinctions themselves merely provide ground for fruitless contestation.

When I use the word ‘consciousness’, I refer very broadly to all that we might call ‘the experiential’. This covers all the activities that go on, for each of us, as we say, *unconsciously* and *preconsciously*, as well as *consciously*; but could not go on without what is conventionally referred to as subjectivity, or inwardness, of some kind. According to one source, ‘our psychological reactions from moment to moment ... are 99.44% automatic.’⁸ You don’t have to buy the precision to get the point. Only a tiny part of our psychological – our mental – life enters our full consciousness so as to form a subject of reflection, that of which we are aware we are aware.

That of which we are unaware of being aware can easily pass into reflexive awareness, and vice versa, as whatever it is comes into, or slips out of, the focus of attention. We should not think of two realms, spatially, as we are wont to do (the unconscious lying *underneath* the conscious), any more than the part of a stage-set on the left lies in a different realm from the part on the right when the spotlight happens to bring one forward and allow the other to recede into darkness. Nor does that part of experience of which we are reflexively aware always have the same qualities. The same set of apparently objective circumstances can appear very differently when our awareness of them changes. William James pointed up the need to avoid conceptualising hard and fast categorisations, when he wrote that ‘our normal waking consciousness, rational consciousness as we call it, is but

one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different',⁹ including a kind of consciousness that particularly interested him (and interests me) in which opposites are experienced as reconciled.

And it is not as if what goes on outside the spotlight is inferior stuff. I discriminate, reason, make judgments, find things beautiful, solve problems, imagine possibilities, weigh possible outcomes, take decisions, exercise acquired skills, fall in love, and struggle to balance competing desires and moral values all the time without being reflexively aware of it. Note that these are not just *calculations*, but rely on my whole embodied being, my experience, my history, my memory, my feelings, my thoughts, my personality, even – dare I say it? – my soul: ‘psyche’ in the broadest sense. It might be asked if it is really then ‘I’ that am responsible for these activities. Yet, regardless of how you choose to phrase it, all this activity still goes on, and in so doing helps constitute my world, who I am, and the quality of my experience. Sooner than place the Cartesian ego first, I would place first and foremost thoughts, feelings, imaginings and responses to the world, embodied and embedded in the world – experience – and allow the ego to take a back seat. As Lichtenberg said, ‘*Es denkt*’: it thinks. Thoughts take place in what I call the ‘field of me’. Even Descartes derived the ego from experience, not experience from an ego. What can more conservatively be claimed is that something about me – in the ‘field of me’ – *permits* these particular activities: and that something is what, in the broad definition, I am calling my consciousness. When I say the ‘field of me’ do not imagine for an instant that I mean something alien, impersonal and abstract, onto which an illusion of ‘me’ is plastered, but something that is at the core of me, something I can convey best in the words of Gerard Manley Hopkins: ‘that taste of myself, of I and me above and in all things, which is more distinctive than the taste of ale or alum, more distinctive than the smell of walnutleaf or camphor, and is incommunicable by any means to another man ... searching nature I taste *self* at but one tankard, that of my own being.’¹⁰

There is, in the physicist Wolfgang Pauli’s terminology, ‘a psyche long before there is consciousness.’¹¹ We do not know the extent of the inner world of other creatures, but as Schiller pointed out, ‘even in highly developed minds judging [the making of judgments in self-awareness] is a relatively rare incident in thinking, and thinking in living, an exception

rather than the rule, and a relatively recent acquisition.’ He reframes such explicit cognitive activity as not the apogee, nor even the norm, of consciousness, but as a somewhat regrettable lapse. The ‘elaborate and admirable organisation’ that results in habit is so efficient that ‘thought, therefore, is an abnormality which springs from a disturbance. Its genesis is connected with a peculiar deficiency in the life of habit.’ Self-conscious thought ‘becomes biologically important’ when, due to the peculiarities of a particular case, ‘the guidance of life by habit, instinct, and impulse breaks down’. He continues:

Thinking, however, is not so much a substitute for the earlier processes as a subsidiary addition to them. It only pays in certain cases, and intelligence may be shown also by discerning what they are and when it is wiser to act without thinking ... Philosophers, however, have very mistaken ideas about rational action. They tend to think that men ought to think all the time, and about all things. But if they did this they would get nothing done, and shorten their lives without enhancing their merriment [how marvellous that a philosopher could then say such things!]. Also they utterly misconceive the nature of rational action. They represent it as consisting in the perpetual use of universal rules, whereas it consists rather in perceiving when a general rule must be set aside in order that conduct may be adapted to a particular case.¹²

This is reminiscent of Whitehead’s admonition, quoted earlier, that ‘operations of thought are like cavalry charges in a battle – they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.’¹³ It is clearly far more efficient to limit the contents of awareness, rendering responses wherever possible automatic. To quote William James: ‘It is a general principle in psychology that consciousness deserts all processes where it can no longer be of use’.¹⁴ What begins as effortful and self-conscious becomes effortless and intuitive, as when a surgeon, pilot or chess player acquires skill, according to ‘a general pattern in which things move from initially conscious to gradually being more automatic.’¹⁵ By that point, the unconscious knowledge is rich, sometimes considerably richer than conscious knowledge. We have already seen that

unconscious processes are often (though by no means always) superior to conscious thought.¹⁶ Self-consciousness may not be necessary, and may even interrupt, the ability to integrate sensory information, to assess emotion and motivation (including the integration of one's mental states with that of others – we rapidly and unconsciously weigh what others know, want and see) and to achieve a global 'take' on a situation.¹⁷ And decisions which require the integration of many sources of information are better made unconsciously, since conscious deliberation interferes with the process of assigning appropriate weight to different sources of information.¹⁸

My point is that included in the broader concept of consciousness as experientiality is much material of which I am not often, or perhaps in some cases ever, reflexively aware. If that suggests that the subject/object divide is not as robust as we assume, and that our perceptions, thoughts and feelings are not located only 'inside' our heads, that is something we may have to accept; and I will return to it again later in the chapter.

CAN WE DENY CONSCIOUSNESS ALTOGETHER?

Attempts to resolve the ‘hard’ problem of how consciousness relates to matter by denying the existence of consciousness are surely the least promising of all – even less promising than attempts to resolve it by denying the existence of matter. We are told by some prominent biologists, skilled undoubtedly in their chosen field, that, once you take science seriously, consciousness and subjectivity are seen to be an illusion. But they’ve got it back to front. What science actually seems to tell us (since I take it that physics is closer to examining the nature of the world – that is what ‘physics’ actually means – than molecular genetics) is that, once you take science seriously, you see that *the notion of science as distinct from consciousness is an illusion*. I expect those of us who are still conscious are more likely to think the physicists right on this one.

I am with analytical philosopher Galen Strawson here, as often on the topic of consciousness, in his opinion that ‘this particular denial is the strangest thing that has ever happened in the whole history of human thought, not just the whole history of philosophy.’ For, as he puts it, ‘experience is itself the fundamental given natural fact; it is a very old point that there is nothing more certain than the existence of experience.’¹⁹

To claim that consciousness is non-existent is self-exploding, since it requires consciousness both to make, and to make sense of, the claim: and to state that consciousness exists, but is an illusion, is no better, since an illusion requires a consciousness in which such an illusion might occur. Some philosophers ‘are prepared to deny the existence of experience’, writes Strawson:

At this we should stop and wonder. I think we should feel very sober, and a little afraid, at the power of human credulity, the capacity of human minds to be gripped by theory, by faith. For this particular denial is the strangest thing that has ever happened in the whole history of human thought, not just the whole history of philosophy. It falls, unfortunately, to philosophy, not religion, to reveal the deepest woo-woo of the human mind. I find this grievous,

but, next to this denial, every known religious belief is only a little less sensible than the belief that grass is green.²⁰

‘The capacity of human minds to be gripped by theory...’ The reader knows by now which hemisphere backs theory in the face of experience. In any case, it is absurd, Strawson continues, to reject the idea of there ‘seeming’ to be experience:

The phenomenon of there seeming to be experience – the phenomenon we’re supposing to be an illusion – can’t exist unless there really is experience. Daniel Dennett tries this move. He proposes that ‘there is no such thing’ as phenomenology: ‘There seems to be phenomenology ... but it does not follow from this undeniable, universally attested fact that there really is phenomenology.’ In fact it does follow, for the reason I’ve just given: for there to seem to be phenomenology is for there to be phenomenology. When it comes to experience, you can’t open up the is/seems gap.²¹

If we seem to have the experience of sunlight on a bowl of strawberries, that means we have the experience of sunlight on a bowl of strawberries. ‘Dennett and his kind find themselves at one with many religious believers’, Strawson comments on another occasion:

This seems at first ironic, but the two camps are deeply united by the fact that both have unshakable faith in something that lacks any warrant in experience. That said, the religious believers are in infinitely better shape, epistemologically, than the Dennettians ...²²

COULD CONSCIOUSNESS BE REDUCED TO ANYTHING ELSE AT ALL?

If it is true that consciousness is ‘the fundamental given natural fact’, it clearly follows that it cannot be reduced to something more fundamental. But is consciousness – the experiential – fundamental? Schrödinger thought so: ‘Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. It cannot be accounted for in terms of anything else.’²³ And others, as we shall see, were with him.

I am not inclined to demur. We know about the experiential directly – from experience; while we assume the non-experiential only indirectly – from experience. Similarly it cannot be denied that matter is something disclosed to me by my mind: I do not know that mind is something disclosed to me by matter – it might be, or it might not. Strawson again:

If we ask what evidence there is for the existence of non-experiential concrete reality, the answer is easy and mathematically precise. There is zero evidence. There is zero observational evidence for the existence of any non-experiential concrete reality. Nor will there ever be any. All there is is one great big, wholly ungrounded, wholly question-begging theoretical intuition or conviction: we don’t see most of the matter around us doing things that we think of as showing signs of experientiality, so we conclude we know it’s not experiential, and that it’s ridiculous to think otherwise. This appears to be the great foundation of the wildly anti-naturalistic naturalism *de nos jours*.²⁴

In other words, a form of anthropomorphism operates in reverse: ‘doesn’t do what humans do with their consciousness, so can’t have it’. Sometimes I am asked, ‘surely you can’t think a mountain has awareness?’ I feel like replying, ‘but how would you expect a mountain to behave if it did have awareness? Mow the lawn, drink a beer and go to Sainsbury’s?’ The idea that consciousness is an ontological primary looks much less bizarre in any other culture than our own. We don’t have the luxury of adopting a common-sense attitude here, because our alternatives are (a)

either consciousness does not exist at all (see above), or (b) it was there all along, in everything. Which is the more absurd?

Strawson continues: ‘The experiential/non-experiential divide, assuming that it exists at all, is the most fundamental divide in nature (the only way it can fail to exist is for there to be nothing non-experiential in nature).’²⁵ Here Strawson alludes to his view, shared by some other Anglo-American analytic philosophers such as Christian de Quincey,²⁶ that the divide can be denied only if, effectively, panpsychism is true (that there is nothing that has no inwardness of some kind, nothing that is wholly *non-experiential* in nature). Panpsychism has a long and venerable history in philosophy both Eastern, as might be anticipated, and Western, which might not.²⁷

To say that experience exists, ‘but is really just something whose nature can be fully specified in wholly non-experiential, functional terms’, is to deny its existence.²⁸ What would it mean for non-experientiality (matter as conventionally conceived) to give rise to experience? This would seem to involve a miracle. Strawson disposes of the argument that it is no different from the ‘emergence’ of liquidity from molecules of H₂O, and other similar examples. ‘For any feature Y of anything that is currently considered to be emergent from X’, he writes, ‘there must be something about X and X alone in virtue of which Y emerges, and which is sufficient for Y.’²⁹ Thus there are obvious, well-known, features of water molecules that predict their fluid motion over one another – in other words, their ‘wateriness’: nothing needs to be added for this to arise. However, there is no feature of matter as conventionally conceived that explains how it could possibly on its own give rise to consciousness.³⁰ Stating that matter ‘just does’ give rise to consciousness is to invoke what is called brute emergence, and ‘brute emergence is by definition a miracle every time it occurs.’³¹

Notice that I say ‘matter as conventionally conceived’. Because if you understood matter in a radically different way, as part of a wholly experiential cosmos, you would have solved the mind/matter problem. But that possibility is open only to those who are willing to entertain that matter is sufficiently different from our usual conception of it that it no longer has the explanatory power relied on by reductionists. According to J.B.S.Haldane, if consciousness were not present in matter, such emergence would be ‘radically opposed to the spirit of science, which has always

attempted to explain the complex in terms of the simple ... if the scientific point of view is correct, we shall ultimately find them [signs of consciousness in inert matter], at least in rudimentary form, all through the universe.’³²

Once again William James delineates the problem most sharply:

The demand for continuity has, over large tracts of science, proved itself to possess true prophetic power. We ought therefore ourselves sincerely to try every possible mode of conceiving the dawn of consciousness so that it may *not* appear equivalent to the irruption into the universe of a new nature, non-existent until then. Merely to call the consciousness ‘nascent’ will not serve our turn. It is true that the word signifies not yet *quite* born, and so seems to form a sort of bridge between existence and nonentity. But that is a verbal quibble. The fact is that discontinuity comes in if a new nature comes in at all. The *quantity* of the latter is quite immaterial. The girl in ‘Midshipman Easy’ could not excuse the illegitimacy of her child by saying, ‘it was a very small one’. And consciousness, however small, is an illegitimate birth in any philosophy that starts without it, and yet professes to explain all facts by continuous evolution. *If evolution is to work smoothly, consciousness in some shape must have been present at the very origin of things.*³³

How could consciousness have emerged *de novo* from matter? It does not matter how much you invoke recursive loops and metaprocesses. They only work once you have already got consciousness: they can’t themselves account for consciousness. The explanatory gap is unbridgeable, certainly by such means. Philosopher of mind Nakita Newton writes that ‘phenomenal consciousness itself is *sui generis*. Nothing else is like it *in any way at all*’.³⁴ Of course, she is consummately right. It comprehensively fails the H₂O-to-liquid test. Other philosophers have expressed similar views. For example, Colin McGinn puts it with customary vividness: ‘You might as well assert that numbers emerge from biscuits or ethics from rhubarb.’³⁵ Searching for an explanation in molecular biology appears to be a category mistake (unless consciousness is already assumed there, in which case it is not an explanation). So Gunther Stent writes:

Searching for a ‘molecular’ explanation of consciousness is a waste of time, since the physiological processes responsible for this wholly private experience will be seen to degenerate into seemingly quite ordinary, workaday reactions – no more and no less fascinating than those that occur in, say, the liver.³⁶

Even Sherrington came to the conclusion that ‘we have difficulty in assigning the lower limit of the mental. It may therefore be that its distribution extends to all organisms, and *even further* ... it is as though the elementary mental had never been wanting.’³⁷ Neuroscientists VS Ramachandran and Colin Blakemore conclude that ‘consciousness, like gravity, mass, and charge, may be one of the irreducible properties of the universe for which no further account is possible.’³⁸ Physicists agree. According to Heisenberg, ‘if we go beyond biology and include psychology in the discussion, then there can scarcely be any doubt but that the concepts of physics, chemistry, and evolution together will not be sufficient to describe the facts.’³⁹ This is very similar to Bohr’s insight that ‘consciousness must be part of nature, or, more generally, of reality, which means that, quite apart from the laws of physics and chemistry, as laid down in quantum theory, we must also consider laws of quite a different kind.’⁴⁰ The great mathematician and physicist von Neumann confirmed that ‘it is inherently entirely correct that the measurement or the related process of the subjective perception is a new entity relative to the physical environment and is not reducible to the latter. Indeed, subjective perception leads us into the intellectual inner life of the individual, which is extra-observational by its very nature.’⁴¹ And in similar vein, Adam Frank, Professor of Astronomy at the University of Rochester, New York, writes that we must entertain the ‘radical possibility that some rudimentary form of consciousness must be added to the list of things, such as mass or electric charge, that the world is built of.’⁴²

There is, to put it conservatively, a good chance they are right. It may be irritating to some to face the fact that after several thousand years of ratiocination and experimentation we are arriving at truths that were anciently known to philosophers and sages, East and West, though it is exciting and perhaps reassuring to have them confirmed by elaborate experimentation.

I must expect at this stage a group of reductionists (themselves rarely physicists) who think of themselves as ‘sceptics’ to treat the very invocation of physics in support of the status of consciousness as something they can dismiss with scorn: derisive phrases such as ‘quantum flimflam’ are bandied around. Physicists themselves do not, for the most part, see it that way. To quote Bohr, who frequently made connexions between an understanding of consciousness and the world,

in our description of nature the purpose is not to disclose the real essence of the phenomena but only to track down, so far as it is possible, relations between the manifold aspects of our experience.^{[43](#)}

I believe the passion with which the ‘sceptics’ dismiss such relations is itself neither scientific nor rational. Its very vehemence leads one to suspect that they may know there is something here so important, and so hard to reconcile with their philosophical position, that they are worried that people will spot that the ‘sceptics’ are wearing no clothes. (By the way, is it more sceptical, or on the contrary more gullible, to believe that consciousness does not exist, or that it can arise with a handwave out of matter?) So we must remember, when predictable noises are heard, that the materialists are entitled to their point of view, but that the attempt to rule quantum physics out of court does not wash, and should be politely refused. To quote the great physicist John Bell: ‘to restrict quantum mechanics to be exclusively about piddling laboratory operations is to betray the great enterprise. A serious formulation will not exclude the big world outside of the laboratory.’^{[44](#)}

CAN WE DENY MATTER ALTOGETHER?

Matter itself is an abstraction which no-one has ever seen: we have only seen elements of the world to which we attribute the quality, within our consciousness, of being material. It both substitutes an idea for an experience (which is a kind of event) and, in doing so, produces something static, no longer in process: no longer an experience, now a *thing*. According to Bohr, 'isolated material particles are abstractions, their properties being definable and observable only through their interaction with other systems.'⁴⁵ Materialism derives the only thing we undeniably know, the concreteness of experience, from an unknown abstraction: matter.

A number of philosophers had already come to this conclusion. Thus FCS Schiller wrote in 1891:

It appears that all we know of matter is the forces it exercises. Matter, therefore, is said to be unknowable in itself ... And yet it is perhaps hardly astonishing that a baseless abstraction should be unknowable in itself. And matter certainly is such an abstraction. For all that appears to us is *bodies*, which we call material. They possess certain more or less obvious points of resemblance, and the abstraction, 'matter', is promptly invented to account for them.⁴⁶

And later:

All the sensible qualities of matter are due to forces, gravitative, cohesive, propulsive, chemical, electrical, or to motions (like heat, sound, light, etc), or 'motive forces'. Matter itself, therefore, is left as the unknown and unknowable substratum of force ... It is not required to explain the appearance of anything we can experience, and is merely a metaphysical fiction designed to provide forces with a vehicle.⁴⁷

But, as we saw in the previous chapter, energy needs no substratum. Above all, matter cannot be called on to bring about the 'annihilation of the

mind by means of one of [the mind's] own abstractions.' ⁴⁸

In a 2017 essay entitled 'Minding matter: the closer you look, the more the materialist position in physics appears to rest on shaky metaphysical ground', Frank eloquently expresses both the mystery of consciousness and the puzzling reluctance of many biologists to entertain theories that venture beyond viewing consciousness as a result of processing in the brain. 'Materialists appeal to physics to explain the mind', he writes, 'but in modern physics the particles that make up a brain remain, in many ways, as mysterious as consciousness itself.' And he continues:

Some consciousness researchers might think that they are being hard-nosed and concrete when they appeal to the authority of physics. When pressed on this issue, though, we physicists are often left looking at our feet, smiling sheepishly and mumbling something about 'it's complicated'. We know that matter remains mysterious just as mind remains mysterious, and we don't know what the connections between those mysteries should be. Classifying consciousness as a material problem is tantamount to saying that consciousness, too, remains fundamentally unexplained. ⁴⁹

Moreover, the observer cannot be excluded from the reality observed. To quote physicist Paul Davies: 'You can't do away with the observer and that's a fact.' ⁵⁰ On which topic, Frank continues that 'putting the perceiving subject back into physics seems to undermine the whole materialist perspective ... A theory of mind that depends on matter that depends on mind could not yield the solid ground so many materialists yearn for.'

All this may be importantly true, but I think we should no more conclude that we can deny matter than that we can deny consciousness. Neither way out of our dilemma is at all satisfactory. What, then, can we say about matter? Strawson uses the word physicalism to refer to a reality which is not antithetically divided into matter and mind, but incorporates both elements as indivisible. From this perspective he writes: 'It's not just that we don't definitely know the nature and limits of the physical. We definitely don't know the nature or limits of the physical. Physics may tell us a great deal about the structure of physical reality', he writes:

but it seems that it can't tell us anything about the intrinsic nature of reality in so far as its intrinsic nature is more than its structure ... It's plain that the human science of physics can't fully characterise the nature of concrete reality, even in principle ... On many matters, such as experience, physics is simply silent. If you're not clear on this limitation, you have no idea what physics is. This isn't New Age anti-scientism, it's hardnosed physicalism.'⁵¹

If asked my view, I would say that matter appears to be an element within consciousness that provides the necessary resistance for creation; and with that, inevitably, for individuality to arise. All individual beings, including ourselves, bring forms into being and cause them to persist: each of us is not, ultimately, any one conformation in matter, but, Ship of Theseus-like, the conformation itself, the morphogenetic field, which requires matter in order to be brought into being, but, once existent, persists while matter comes and goes within it. Remember Schopenhauer: 'Matter is that which persists and endures.'⁵² Since the development of new such form-fields in consciousness seems to be part of the creative process of the cosmos, the lending of persistence (for a while) may be matter's peculiar role.

That may raise more questions than it answers, but it is something we can come back to. Meanwhile, as Frank puts it, 'rather than trying to sweep away the mystery of mind by attributing it to the mechanisms of matter, we must grapple with the intertwined nature of the two.'⁵³

ARE MATTER AND CONSCIOUSNESS ONE AND THE SAME?

The problem for Descartes was how mind, *res cogitans*, could interact with matter, *res extensa*. That each affects the other is amply confirmed by modern physics, if by nothing else (I will come to other evidence in due course). So the idea that they are so separate that they cannot interact can safely be dismissed. Are they perhaps, then, the same?

Whitehead thought that the ‘sharp division between mentality and nature has no ground in our fundamental observation’, and that ‘we should conceive mental operations as among the factors which make up the constitution of nature.’⁵⁴ Certainly matter is not complete without the incorporation of consciousness. The theoretical physicist and mathematician Eugene Wigner pointed out that ‘it was not possible to formulate the laws of quantum mechanics in a fully consistent way without reference to the consciousness.’⁵⁵ Physicist and philosopher Carl von Weizsäcker went further: ‘consciousness and matter are different aspects of the same reality.’⁵⁶

Such ideas go back a long way in philosophy before modern physics. Schopenhauer, for example, held that

a consciousness without object is no consciousness at all ... although materialism imagines that it postulates nothing more than this matter – atoms for instance – yet it unconsciously adds not only the subject, but also space, time, and causality, which depend on special determinations of the subject ... the intellect and matter are correlatives, in other words, the one exists only for the other; both stand and fall together; the one is only the other’s reflex. They are in fact really one and the same thing, considered from two opposite points of view.⁵⁷

That might seem odd, simply because matter doesn’t behave like consciousness. However ice doesn’t behave like water: it is solid, comes in chunks, is opaque, and so hard it can split your head open, while water is fluid, seamless, transparent and can be so dispersed that we cannot see it or

touch it at all. Ice is a ‘phase’ of water. Could matter be a ‘phase’ of consciousness?

At the quantum level, are consciousness and matter like those creatures that are neither plant nor animal, or both plant and animal? Is a quark material, or an aspect of consciousness – or both, or neither? In a letter to his colleague Abraham Pais, Wolfgang Pauli speculated that a science of the future would refer to such a basic reality as neither psychic nor physical, but somehow both of them and somehow neither of them.⁵⁸ He suggested that the mental and the material domains of basic reality should be understood as complementary aspects under which this reality can appear.⁵⁹ This suggests that we have to give up a conception of matter that excludes consciousness and a conception of consciousness that precludes matter, even though we may be able to conceive them distinctly only one at a time. Mass and energy are interconvertible: the brain is a manifestation as mass, the mind a manifestation as energy.

‘Bohr’s principle of complementarity is the most revolutionary scientific concept of this century and the heart of his fifty-year search for the full significance of the quantum idea’, wrote the theoretical physicist John Archibald Wheeler.⁶⁰ Complementarity – the principle that objects have certain pairs of complementary properties which cannot be observed or measured simultaneously – is most commonly thought of in relation to position and momentum, but has further applications within physics. Extending the concept of complementarity somewhat, Pauli writes:

the only acceptable point of view appears to be the one that recognises *both* sides of reality – the quantitative and the qualitative, the physical and the psychical – as compatible with each other, and can embrace them simultaneously ... it would be most satisfactory of all if physis [physical nature] and psyche could be seen as complementary aspects of the same reality.⁶¹

Pauli did not intend that to be seen as a merely technical point. He advanced the opinion that the ‘issue of complementarity within physics naturally leads beyond the narrow field of physics to analogous conditions of human knowledge’.⁶² And Bohr would have agreed: ‘Bohr’s preeminent concern was to extend the idea of complementarity beyond physics.’⁶³

That contraries fulfil one another (or *contraria sunt complementa*, as Bohr's coat of arms declared) appears odd to us only because of the pervasive and restrictive influence on the Western capacity for thought of Plato and Aristotle. In a memoir of Bohr at the time of his death, his colleague the physicist Léon Rosenfeld wrote:

I had occasion to discuss Bohr's ideas with the great Japanese physicist [Hideki Yukawa], whose conception of the meson with its complementary aspects of elementary particle and field of nuclear force is one of the most striking illustrations of the fruitfulness of the new way of looking at things that we owe to Niels Bohr. I asked Yukawa whether the Japanese physicists had the same difficulty as their Western colleagues in assimilating the idea of complementarity and in adapting themselves to it. He answered 'No, Bohr's argumentation has always appeared quite evident to us'; and, as I expressed surprise, he added, with his aristocratic smile, 'You see, we in Japan have not been corrupted by Aristotle.'⁶⁴

To which, Rosenfeld adds: 'If Yukawa had also mentioned Plato, his epigram would have given a complete characterization, which it would be difficult to make more pregnant, of the significance of Bohr's contribution to philosophical thought.'

All this is in keeping with Strawson's position that there is nothing 'merely physical' about the physical:

If everything that concretely exists is intrinsically experience-involving, well, that is what the physical turns out to be; it is what energy (another name for physical stuff) turns out to be. This view does not stand out as particularly strange against the background of present-day science, and is in no way incompatible with it.⁶⁵

So far, so good. But should we conclude that matter and consciousness are simply one? They may be instantiations or aspects of one entity or process, but they are surely different. And the observer and the observed, though they are each affected by the other, must remain at least partly distinct. Yet in the quantum world we cannot assume that any of these are

ultimately separate. The world I *know* is the world as *I* know it. According to Werner Heisenberg:

Natural science does not simply describe and explain nature; it is a part of the interplay between nature and ourselves; it describes nature as exposed to our method of questioning. This was a possibility Descartes could not have thought, but it makes the sharp separation between the world and the I impossible.⁶⁶

Planck puts it like this: ‘As every act of research measurement has a more or less causal influence on the very process that is under observation, it is practically impossible to separate the law that we are seeking to discover behind the happening itself from the methods that are being used to bring about the discovery.’⁶⁷ Sir James Jeans had this to say in an address to the British Association for the Advancement of Science, of which he was President:

There is, in fact, no clear-cut division between the subject and object; they form an indivisible whole which now becomes nature. This thesis finds its final expression in the wave-parable, which tells us that nature consists of waves and that these are of the general quality of waves of knowledge, or of absence of knowledge, in our own minds.⁶⁸

This suggests two important conclusions. The first is that the way in which we approach Nature governs what we find (science gives not an account of nature *tout court*, but an account of nature ‘as exposed to our *method of questioning*’). Thus, to quote Pauli, it may even depend on the *nature* of the individual observer:

Modern microphysics turns the observer once again into a little lord of creation in his microcosm, with the ability (at least partially) of freedom of choice and fundamentally uncontrollable effects on that which is being observed. But if these phenomena are dependent on how (with what experimental system) they are observed, then is it

not possible that there are *also* phenomena ... that depend on *who* observes them (ie, on the nature of the psyche of the observer)?’⁶⁹

The second is this: that the conclusion we should draw is – *not* that all that we can encounter are *representations* of something we cannot know – but the precise opposite: that we do actually deal with reality and know it, just with an aspect of it that *we partly call forth ourselves by our approach*. The fact that we play a part in its being what it is does not make it unreal.

In a variation of a thought experiment known as the Frauchiger-Renner experiment, Matthew Leifer has shown that there is no single outcome of a given measurement that’s objectively true for all observers: the results of measurements depend on the perspective of the observer.⁷⁰ This bears out Wheeler’s dictum that ‘quantum states are not physical objects: they exist only in our imagination ... reality may be different for different observers.’⁷¹ But note that nothing in all of this makes what we take to be reality ‘really’ an illusion. Einstein is credited with having said that ‘reality is merely an illusion, albeit a very persistent one’. There is no evidence that I know of that Einstein ever said any such thing, nor is such a statement in keeping with, for example, his distress at not being able to square relativity with quantum mechanics. Whether Einstein said anything like it or not, the remark is deeply mistaken. If you believe matter is the only reality, and you then learn that matter as you think of it is illusory, you will conclude that reality is illusory. But it is not. It is matter, *as we think of it*, that is an illusion. And there is more to reality than matter. It was your thinking that misled you.

IF MATTER AND CONSCIOUSNESS ARE DIFFERENT, IN WHAT RESPECT?

How on earth might consciousness – immaterial and lacking extension in space as it is – emerge from matter, which is very clearly both material and extended in space? Since, as Colin McGinn reflects, this ‘looks more like magic than a predictable unfolding of natural law’, he suggests ‘the following heady speculation: that the origin of consciousness somehow draws upon those properties of the universe that antedate and explain the occurrence of the big bang ... If so, consciousness turns out to be older than matter in space, at least as to its raw materials.’⁷² That would be one very important difference.

In that form it is indeed a speculation, but so is the idea that matter precedes consciousness; by contrast, that consciousness precedes matter is an idea that has an ancient lineage, and more than a little, I shall suggest, going for it. Matter could be born of consciousness without either being the same as, or wholly distinct from, the other. And if true, a form of asymmetry familiar to the readers of this book would operate: mind and matter being aspects of the same thing, but that not of itself making them equal.

Schrödinger points out that though what we see depends on consciousness, consciousness itself is nowhere to be seen.⁷³ We look for it in the field, and do not see it, not realising it is itself the ground on which we stand to search: as the eye sees itself nowhere in the picture of the world it brings into being. Perhaps, then, we should expect matter to be visible within consciousness, but hardly consciousness within matter, since consciousness would have to see itself therein. This would agree with Schrödinger’s conclusion: ‘Mind has erected the objective outside world of the natural philosopher out of its own stuff. Mind could not cope with this gigantic task otherwise than by the simplifying device of excluding itself – withdrawing from its conceptual creation. Hence the latter does not contain its creator.’⁷⁴

A long roll call of the most distinguished physicists would support the view that the originary ‘stuff’ of the universe is consciousness. Thus Max Planck was famously asked whether he thought consciousness could be

explained in terms of matter and its laws. ‘No’, he replied. ‘I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.’⁷⁵ It is worth noting that the interviewer prefaces his piece with the remark: ‘In my interview with him Professor Planck replied to all my questions with a quite remarkable lack of hesitation. It would seem that his ideas on these subjects are now definitely formed, or else that he thinks with remarkable rapidity – probably both suppositions are true.’ Thirteen years later, and three years before he died, Planck went further:

As a physicist, and therefore as a man who has spent his whole life in the service of the most down-to-earth science, namely the exploration of matter, no one is going to take me for a starry-eyed dreamer. After all my exploration of the atom, then, let me tell you this: there is no matter as such. All matter arises and exists only by virtue of a force which sets the atomic particles oscillating, and holds them together in that tiniest of solar systems, the atom ... we must suppose, behind this force, a conscious, intelligent spirit. This spirit is the ultimate origin of matter.⁷⁶

Eugene Wigner concurs: ‘It will remain remarkable, in whatever way our future concepts may develop, that the very study of the external world led to the scientific conclusion that the content of consciousness is the ultimate universal reality.’⁷⁷ This theme is picked up by the geneticist Ho. When ‘reductionist, atomistic science is pursued to its logical conclusion’, she writes, ‘and pushed to its very limits, it can only undermine the basis on which it was built. For everywhere, it reaffirms the unity of nature in which the knowing being is inextricably embedded, compelling us towards a new knowledge system and a new way of knowing that is at the same time very old.’⁷⁸

A passage of the great astronomer, physicist and mathematician Sir Arthur Eddington deserves quotation in full:

The universe is of the nature of a thought or sensation in a universal Mind ... To put the conclusion crudely – the stuff of the world is

mind-stuff. As is often the way with crude statements, I shall have to explain that by 'mind' I do not exactly mean mind and by 'stuff' I do not at all mean stuff. Still this is about as near as we can get to the idea in a simple phrase. The mind-stuff of the world is, of course, something more general than our individual conscious minds; but we may think of its nature as not altogether foreign to the feelings in our consciousness ... *It is the physical aspects of the world that we have to explain.*

And, in a phrase that is in direct opposition to the aspirations of materialist reductionism: 'Our bodies are more mysterious than our minds.'⁷⁹

Eddington continues:

Consciousness is not sharply defined, but fades into sub-consciousness; and beyond that we must postulate something indefinite but yet continuous with our mental nature. This I take to be the world-stuff ... We have only one approach, namely, through our direct knowledge of mind. The supposed approach through the physical world leads only into the cycle of physics, where we run round and round like a kitten chasing its tail and never reach the world-stuff at all ... It is difficult for the matter-of-fact physicist to accept the view that the substratum of everything is of mental character. But no one can deny that mind is the first and most direct thing in our experience, and all else is remote inference – inference either intuitive or deliberate.'⁸⁰

Another classic statement comes again from Sir James Jeans, also a physicist, astronomer and mathematician:

The stream of knowledge is heading towards a non-mechanical reality; the universe begins to look more like a great thought than like a great machine. Mind no longer appears to be an accidental intruder into the realm of matter ... we ought rather hail it as the creator and governor of the realm of matter.'⁸¹

Many modern physicists speak in a similar vein, though perhaps less eloquently. Sir Roger Penrose declares: ‘I think that matter itself is now much more of a mental substance’.⁸²

Astronomical physicist Richard Conn Henry writing in *Nature* avers that ‘the Universe is entirely mental ... and we must learn to perceive it as such’.⁸³ Elsewhere he expands on this theme, and goes further:

Non-local causality is a concept that had never played any role in physics, other than in rejection (‘action-at-a-distance’), until Aspect showed in 1981 that the alternative would be the abandonment of the cherished belief in mind-independent reality; suddenly, spooky-action-at-a-distance became the lesser of two evils, in the minds of the materialists. Why do people cling with such ferocity to belief in a mind-independent reality? It is surely because if there is no such reality, then ultimately (as far as we can know) mind alone exists. And if mind is not a product of real matter, but rather is the creator of *the illusion of* material reality (which has, in fact, despite the materialists, been *known* to be the case, since the discovery of quantum mechanics in 1925), then a theistic view of our existence becomes the only rational alternative to solipsism.⁸⁴

(In Chapter 28 I will return to what may or may not be meant by theism here.)

Astrophysicist Bernard Haisch states: ‘It is not matter that creates an illusion of consciousness, but consciousness that creates an illusion of matter.’⁸⁵ And according to Henry, ‘that is correct physics: it is not controversial in the *slightest* degree that there is no reality; this has been demonstrated in both theory and experiment’.⁸⁶ Presumably, once again, it depends on what you mean by reality. While it is not the way it seems till it seems it to you, must we conclude that it is invented *ex nihilo* by your looking at it? Surely not. There are constraints on what it can be, otherwise everything would be as true as everything else, and thought, speech, action and even existence itself would become pointless.

The danger of naïve idealism

There is a sort of suffocation induced by the view that we alone create reality. Planck says ‘all ideas of the form of the outer world are ultimately only reflections of our own perceptions’,⁸⁷ and something in me partly consents, partly recoils. There is a wonderful passage at the end of Eddington’s book *Space, Time and Gravitation*, that I cannot forbear quoting:

The theory of relativity has passed in review the whole subject-matter of physics. It has unified the great laws, which by the precision of their formulation and the exactness of their application have won the proud place in human knowledge which physical science holds to-day. And yet, in regard to the nature of things, this knowledge is only an empty shell – a form of symbols. It is knowledge of structural form, and not knowledge of content. All through the physical world runs that unknown content, which must surely be the stuff of our consciousness. Here is a hint of aspects deep within the world of physics, and yet unattainable by the methods of physics. And, moreover, we have found that where science has progressed the farthest, the mind has but regained from nature that which the mind has put into nature. We have found a strange foot-print on the shores of the unknown. We have devised profound theories, one after another, to account for its origin. At last, we have succeeded in reconstructing the creature that made the foot-print. And Lo! it is our own.⁸⁸

While appreciating the deep wisdom of this image, I think that we are not alone in a dead universe. It is that reciprocity that I miss here, stirring as the passage may be. It is important to note that while we help bring the world about, we are constrained by something other than ourselves – and at that, not a little. According to Henry Pierce Stapp, an American mathematical physicist who worked closely with Heisenberg, Pauli and Wheeler, ‘in the quantum world the observing processes of acquiring empirical knowledge must disturb, or perhaps even bring into existence, the values that we observe. By virtue of Heisenberg’s discovery, the process of our acquiring knowledge about the material aspects of nature cannot merely reveal already existing values. The process of our acquiring knowledge

injects our mental aspects in an essential way into the process that determines “what we will find if we look””.⁸⁹ In other words, the process is genuinely both creative and undetermined.

On the other hand, it seems to me that there is an electron we did not actually put there. When all’s said and done, what seems most true to experience is the rather modest view expressed in Wheeler’s famous pronouncement: ‘This is a participatory universe.’⁹⁰ The phrase is somewhat in line with Bohr’s reflection that ‘the new situation in physics has ... forcibly reminded us of the old truth that we are *both onlookers and actors* in the great drama of existence.’⁹¹ Both. Or as Stapp puts it,

the new theory elevates our acts of conscious observation from causally impotent witnesses of a flow of physical events determined by material processes alone to irreducible mental inputs into the determination of the future of an evolving psycho-physical universe. In this orthodox quantum mechanical understanding of the world our minds matter.⁹²

Wheeler goes further:

No theory of physics that deals only with physics will ever explain physics. I believe that as we go on trying to understand the universe, we are at the same time trying to understand man. Today I think we are beginning to suspect that man is not a tiny cog that doesn’t really make much difference to the running of the huge machine but rather that there is a much more intimate tie between man and the universe than we heretofore suspected ...⁹³

While, of course, sympathetic to this, I find the emphasis on human life rather than life more generally (to be fair, characteristic of its period) jars slightly. And he rephrased it here:

Modern quantum theory, the overarching principles of twentieth-century physics, leads to quite a different view of reality, a view that man, or intelligent life, or communicating observer participators are

the whole means by which the very universe is created: without them, nothing.⁹⁴

What seems to me indisputable is that there is a relationship of reciprocity. That for me would be a touchstone of whether we are on the right path. In such a relationship both – or all – parties are changed. The reciprocal truth of the observer changing what is observed is that what is observed changes the observer. This was a view espoused by Goethe, and not just in the obvious ways you might imagine. According to him, we literally grow faculties. He held that an object properly contemplated generates in the beholder the faculty proper to its own perception: ‘Every new object, well contemplated and clearly seen, opens up a new organ within us’.⁹⁵ Contemplation of the world in a spirit of openness and humility fundamentally enlarges our being, where dogma and complacency simply narrow it.

Equally it enables the greater reality of the cosmos – whatever it may be – to fulfil itself through us.

A theme of our explorations has been the status of things. Things, it seems, emerge from our descriptions of experience: they do not constitute it. Whether a thing enters our world or not depends on the scale at which it is seen, or sought, as stem cell researcher and complexity theorist Neil Theise demonstrates:

Ant colonies are a good example: from afar, the colony appears to be a solid, shifting, dark mass against the earth. But up close, one can discern individual ants and describe the colony as the emergent self-organization of these scurrying individuals. Moving in still closer, the individual ants dissolve into myriad cells ... The cell as a definable unit exists only on a particular level of scale. Higher up, the cell has no observational validity. Lower down, the cell as an entity vanishes, having no independent existence. The cell as a thing depends on perspective and scale: ‘now you see it, now you don’t’, as a magician might say.⁹⁶

And as Theise and a colleague, physicist Menas Kafatos, put it elsewhere: ‘No single scale of observation can reveal the whole; at the

moment selection is made of a scale of observation, the features of other levels of scale are hidden from view.’⁹⁷ This intrinsic incompleteness of any one point of view is a theme of this book, wonderfully imaged in the Japanese Zen garden, Ryōan-ji, referred to earlier.

It may be objected that, whether we see something or not, it still exists. But what that tells us is that a ‘thing’ is a category within our thought. I am reminded here of Ruskin’s observation about seeing things clearly. ‘We never see anything clearly’, he writes; ‘what we call seeing a thing clearly, is only seeing enough of it to make out what it is; this point of intelligibility varying in distance for different magnitudes and kinds of things’.⁹⁸ If Nietzsche was right in saying that ‘A thing = its qualities’,⁹⁹ and qualities change unrecognisably with scale, so do things come and go from experience depending on how they are observed. As the perspective shifts so do the *Gestalten*.

Theoretical physicist and mathematician Freeman Dyson noticed something interesting about scale: how seeing a *mechanism* is a feature of a certain scale of vision. ‘For the biologists’, he wrote, ‘every step down in size was a step toward increasingly simple and mechanical behaviour’:

A bacterium is more mechanical than a frog, and a DNA molecule is more mechanical than a bacterium. But twentieth-century physics has shown that further reductions in size have an opposite effect. If we divide a DNA molecule into its component atoms, the atoms behave less mechanically than the molecule. If we divide an atom into nucleus and electrons, the electrons are less mechanical than the atom.¹⁰⁰

Once one reaches quantum level, events cannot be separated from the consciousness of the observer, and

the laws leave a place for mind in the description of every molecule ... In other words, mind is already inherent in every electron, and the processes of human consciousness differ only in degree but not in kind from the processes of choice between quantum states which we call ‘chance’ when they are made by electrons.¹⁰¹

It is sometimes objected that quantum effects ‘wash out’ when a system is viewed at the level of everyday. Not so, according to Stapp:

The oft-heard claim that ‘quantum mechanics is not relevant to the mind-brain problem because quantum theory is only about tiny things’, is absolutely contrary to the basic quantum principles ... Quantum mechanics is explicitly designed to cover ‘big’ systems, and by becoming ‘big’ a quantum system does not become classical! Indeed, the fact that quantum mechanics is explicitly designed to cover big things is important to the solution of the mind-brain problem.^{[102](#)}

IS CONSCIOUSNESS, THEN, NOT JUST IN US BUT IN EVERYTHING THAT EXISTS?

Physicalism, according to Strawson, ‘entails panexperientialism or panpsychism. All physical stuff is energy, in one form or another, and all energy ... is an experience-involving phenomenon.’¹⁰³ Heraclitus already saw that ‘mind is common to all things’.¹⁰⁴ Indeed he said that all things are full of soul, which is perhaps even more astute.¹⁰⁵ Soul (*psuchē* or *psyche*) in Heraclitus is limitless (not material or extended in space), as is Anaximander’s *apeiron*, the unbounded origin of all things. Soul, too, according to Heraclitus scholar Charles Kahn, is for Heraclitus a first principle, or *archē*.¹⁰⁶ In Heraclitus’ philosophy, all things are requital for fire, and fire for all things – which implies that matter and energy are aspects of one and the same entity (something that science has discovered relatively recently: $E = mc^2$).¹⁰⁷ Energy, in the form of fire, and *psyche*, play a similar role in his philosophy: each is universal, each is all-inclusive. And of the soul, he wrote, ‘You will not find out the limits of the soul whatever way you travel, so deep is its *logos*.’¹⁰⁸

After Heraclitus, Empedocles too gave it as his opinion ‘that all things have thought (*phronēsis*) and a share of mind (*noēma*).’¹⁰⁹ The Roman philosopher Epicurus argued that will could not arise *de novo*, and therefore that, since Nature exhibits will in her creatures, the atoms from which everything was made had to possess a kind of will themselves. Nature embodies drives, but drives themselves are not material. Will must therefore be present in some form in the fundamental principles of the universe. Much later Spinoza and Leibniz were panpsychists, as were probably Goethe, and his contemporary, the philosopher Herder, who considered the forces in plants and stones as analogous to the soul, each endowed with a different degree of consciousness.¹¹⁰

Schopenhauer was also a kind of panpsychist. ‘Among people untrained in philosophy’, he wrote, ‘there still exists the old, fundamentally false antithesis between mind and matter.’¹¹¹

His argument, that we do not understand matter so long as we imagine it to be simple ‘stuff’ devoid of mind, is based on observations that (for

obvious reasons) do not rely on quantum physics, but apply to classical physics too, and are therefore deserving of special consideration:

You believe you perceive dead (ie completely passive) material, void of all qualities, because you suppose you can truly understand everything which you are able to trace back to a *mechanistic* effect. But as physical and chemical effects are avowedly incomprehensible to you so long as you cannot trace them back to mechanistic effects, so are these mechanistic effects themselves – that is to say, modes of expression proceeding from weight, impenetrability, cohesion, hardness, inflexibility, elasticity, fluidity, etc – just as mysterious as these others, indeed as mysterious as thought in the human head.¹¹²

And he anticipates Bertrand Russell's point that from physics we know nothing of the physical world other than its mathematical structure. 'What is really comprehensible through and through in mechanics', writes Schopenhauer,

extends no further in any account of an effect than what is purely mathematical; it is limited, that is to say, to determining its spatial and temporal qualities ... In short: all ostensible mind can be attributed to matter, but all matter can likewise be attributed to mind; from which it follows that the antithesis is a false one.¹¹³

Here is Russell for comparison: 'we know the intrinsic character of the mental world to some extent, but we know absolutely nothing of the intrinsic character of the physical world'.¹¹⁴ What Russell means by this is, of course, from physics alone (or what Schopenhauer calls 'mechanics'). Hence his remark that 'physics is mathematical, not because we know so much about the physical world, but because we know so little: it is only its mathematical properties that we can discover. For the rest our knowledge is negative.'¹¹⁵ Again he speaks of our knowledge *from physics*. Sir Arthur Eddington made a similar point in a passage I quoted earlier.

But since it is only such a kind of thinking, from which all human understanding has been stripped away and reduced to maths, that would make us think that consciousness and matter were sundered in the first

place, it is the reductionist's unwarranted assumption that consciousness does not enter into matter that we must address.

Amongst philosophers since Schopenhauer who were in some respect panpsychist one would have to include Peirce, James, Dewey, Bergson, Whitehead and Hartshorne amongst others. Even the sceptical Russell addressed the issue of mind and matter in a spirit that is open to panpsychism:

My own feeling is that there is not a sharp line, but a difference of degree; an oyster is less mental than a man, but not wholly unmental. And I think 'mental' is a character, like 'harmonious' or 'discordant', that cannot belong to a single entity in its own right, but only to a system of entities ... inanimate matter, to some slight extent, shows analogous behavior [to memory] ... The events that happen in our minds are part of the course of nature, and we do not know that the events which happen elsewhere are of a totally different kind. The physical world ... is perhaps less rigidly determined by causal laws than it was thought to be; one might, more or less fancifully, attribute even to the atom a kind of limited free will.¹¹⁶

The eminent evolutionary biologist Sir Julian Huxley wrote that the relation between mind and matter is so close that

mind or something of the nature as mind must exist throughout the entire universe. This is, I believe, the truth. We may never be able to prove it, but it is the most economical hypothesis: it fits the facts much more simply ... than one-sided idealism or one-sided materialism.¹¹⁷

And in his introduction to Teilhard de Chardin's masterwork *The Phenomenon of Man* he wrote:

evolutionary fact and logic demand that minds should have evolved gradually as well as bodies and that accordingly mind-like properties ... must be present throughout the universe ... we must

infer the presence of potential mind in all material systems, by backward extrapolation from the human phase to the biological, and from the biological to the inorganic.^{[118](#)}

In biology the issue is no less pressing, and perhaps more pressing, since the issue of emergence of mind is not purely historical, located in some, for practical purposes theoretical, *primaeval* past, but immediate and present every time a new life comes into being. If the two cells, sperm and egg, out of which the embryo proceeds, are to be considered mindless and yet a newborn infant is not, at what point in this process does mind, brutishly, emerge? And why just there? And what is to one side of it? To quote again the mother of the illegitimate baby in *Mr Midshipman Easy*: ‘if you please, ma’am ... it was *such a little one*.’^{[119](#)} There is no difficulty with ‘little’ for those who believe consciousness was there all along; but a problem for those who don’t, because, however little, its coming about at all still requires a miracle.

About 30 years after Haldane, the biologist Bernhard Rensch, an architect of the mainstream Modern Synthesis theory of evolution, asserted that, just as there is a blurring of categories when we examine the evolution of one life form to another at the level of microorganisms and cells, the stark division between living and non-living systems is blurred, and a mistaken distinction likely carries over to the boundaries of conscious experience as well.^{[120](#)}

In sum, it seems that (1) mind and matter have a close relationship; that (2) we cannot logically dismiss the existence of consciousness; and (3) ought to be unwilling to dismiss the existence of matter; that (4) they are not so distinct that they cannot interact; that (5) neither are they identical; and yet (6) may be aspects of one and the same reality. Nonetheless (7) they are not equal, in that there is reason to believe that consciousness is prior ontologically to matter.

CONSCIOUSNESS AND LIFE

Up to this point I have concerned myself mainly with consciousness in the universe as a whole, both animate and inanimate. But animacy, otherwise known as life, is different from inanimacy. Where there is animacy, both consciousness and matter equally *evolve* much faster than they would do in its absence; or, to use a both more familiar and less appropriable terminology, they *become* faster than in its absence. I recently came across this quote from Bohm: ‘when one analyses processes taking place in inanimate matter over long enough periods of time, one finds a similar behaviour [to living processes]. Only here the process is so much slower...’¹²¹ And what gives us the impression of increasing complexity in evolution is the way consciousness, more than matter, *becomes* – increasingly complex.

The re-admission of the observer’s consciousness into the description of the cosmos is a change of unequalled significance in the history of science since its banishment in the seventeenth century. In a theme that should be familiar to my readers, that exile enabled us to become hugely, indisputably, powerful; but at the price of a lack of understanding of what it is we had power over. ‘An adequate scientific theory of reality’, writes Stapp, ‘ought to accommodate *all* the regularities of human experience. This includes not only the results of experiments pertaining to astronomical, terrestrial, and atomic physics, but also to the experiences of normal everyday life.’¹²² Until the advent of quantum mechanics, the most important fact of nature, the existence of consciousness, was banished from the scientific world-picture, in which everything was supposed to be accounted for in non-experiential terms. But its enforced repatriation by quantum physics, though unreservedly to be welcomed, will scarcely have more than a technical effect on science, as long as science still assumes that all can, ultimately, be reduced to physics and chemistry.

Physics can’t, as Russell points out, tell you anything about reality except the mathematics of its structure; and it can’t begin to help with what cannot be measured. Even in what can be measured, the observer, as we have seen, plays a key role, but where measurement is excluded the observer is all-important. The phrase ‘the observer’, by the way, already

seems to refer to a third party. But it doesn't. The observer is *you and me*. And observation describes not an 'I-It' but an 'I-Thou' relationship. We are not distinct from – *over against* – Nature: we emerge out of, live within, and return to Nature. In a sense we are Nature herself reflecting on Nature. Seeing this does not exclude the adoption of other perspectives, when required; but this particular perspective cannot be excluded or circumvented. Thus Whitehead:

For natural philosophy everything perceived is in nature. We may not pick and choose. For us the red glow of the sunset should be as much part of nature as are the molecules and electric waves by which men of science would explain the phenomenon ... We are instinctively willing to believe that by due attention, more can be found in nature than that which is observed at first sight. But we will not be content with *less*.¹²³

There is a dialogue between our own consciousness and the aspects of the world we experience. For example, the experience of listening to music is a betweenness. Is it just out there, on its own? Clearly not. Is it, then, just in my brain? Clearly not. It exists only when outer and inner come together: that is, it lies in the betweenness. Experience – mind – is always a betweenness. And I believe all reality is like this. Outer and inner should not be separated; if they are, they become separately inert, since everything arises from their being together. In Goethe's wonderful words: *Natur hat weder Kern / Noch Schale, / Alles ist sie mit einemale* ('Nature has neither kernel nor shell: she is everything at once').¹²⁴ Apparently Wittgenstein was so taken with this expression of the transcendence of dualism that he considered using it as an epigraph to the *Investigations*.¹²⁵ This transcendence of dualism is also the core insight of Schelling's philosophy.

Science can legitimately add to our experience – that's why we value it – but it cannot legitimately diminish our experience simply on the grounds that it doesn't know how to deal with much of it. Whitehead continues that science must not imply that we 'add in' what we understand and perceive, as though it were somehow extraneous to the 'scientific facts'. We should not be asked to imagine that we *add* the greenness of grass: 'what is given

in perception is the green grass. This is an object which we know as an ingredient in nature.’ He argues against what he calls

the bifurcation of nature into two systems of reality, which, in so far as they are real, are real in different senses. One reality would be the entities such as electrons which are the study of speculative physics. This would be the reality which is there for knowledge; although on this theory it is never known.¹²⁶

The other sort of reality, the part that is in reality directly known, would be seen as merely the ‘byplay of the mind’ – a ‘dream’. In this scheme our ‘conjecture’, our theory, about reality would take precedence over experience. *Wissen* would triumph over *kennen*. This is what Whitehead called the *fallacy of misplaced concreteness*. It operates wherever the theory, the map, displaces the terrain that is mapped, and is taken for the reality. It is a fallacy to which, as we have seen, the left hemisphere is peculiarly susceptible, since the left hemisphere is better at producing models than engaging with reality – and models are inevitably simpler (therefore more prone to convey a false sense of total understanding) than the reality they model. Whitehead insists that

a cosmology should above all things be adequate. It should not confine itself to the categorical notions of one science, and explain away everything that will not fit in. Its business is not to refuse experience but to find the most general interpretive system.¹²⁷

However, the lack of acknowledgment of the place of psyche within the framework of physics, which Schrödinger, Planck, Heisenberg, Pauli and Bohr all lamented, no longer obtains. Things are moving on. According to Stapp, it is crucial to appreciate that orthodox quantum theory is intrinsically a *psychophysical* theory, ‘fundamentally a causal weaving together of our streams of conscious experiences, described in psychological terms, with a theoretical representation of the physical world described in mathematical language.’¹²⁸ In 1938 Jung, who collaborated intensely with Pauli over a period of nearly 30 years, wrote to another colleague:

though the methods of modern physics are different from those of psychology their fundamental ideas are not. I would not be surprised if one day we saw a far-reaching agreement between the basic formulations of psychology and physics. I am convinced that if the two sciences pursue their goals with the utmost consistency and right into the ultimate depths of man they must hit upon a common formula.¹²⁹

In Chapter 12, I tried to convey the sheer scale and complexity of organisation, responsiveness to the outer and inner environment, decision-making and apparent purposiveness conveyed by a single cell, let alone millions – or trillions – of them acting in concert. I say ‘apparent’, because it is intrinsically impossible to be certain that some experientiality, some awareness, some purposive drive is being manifested. However it is, for the same reason, intrinsically impossible to be certain that it is not; and anyone watching cells at work, and engaging with what they can see, will have to do violence to their intuition and imagination, and simultaneously indulge in what Whitehead called ‘brilliant feats of explaining away’, in order to convince themselves that no purposeful responses are to be seen there.¹³⁰ And given the *intrinsic* undecidability of the matter, one way or the other, why would one even *want* to believe that? Let alone be so sure one is right as to turn the idea into an orthodoxy that no scientist must deny, on pain of expulsion from the scientific ‘community’. (Science has its excommunications.) Here is cell biologist Bruce Lipton:

Each cell is an intelligent being that can survive on its own, as scientists demonstrate when they remove individual cells from the body and grow them in a culture ... these smart cells are imbued with intent and purpose; they actively seek environments that support their survival while simultaneously avoiding toxic or hostile ones. Like humans, single cells analyse thousands of stimuli from the microenvironment they inhabit. Through the analysis of this data, cells select appropriate behavioural responses to ensure their survival. Single cells are also capable of learning through these environmental experiences and are able to create cellular memories, which they pass on to their offspring.¹³¹

It seems to me, given everything else we know, that the explanatory burden is on those who would have mindless mechanisms give rise to sentient beings to tell us how, why and at what point they do so.

We have seen that one aspect of nature, both animate and inanimate, is its tendency to repeat patterns at different levels of the same whole: fractality. When one compares the single cell to the whole organism to which it belongs – in other words, over the most colossal scale – one finds that common to each are the needs to co-ordinate information, to exchange energy with the surroundings, to have a functioning system of internal distribution, to have the ability to repair and protect itself, to exert ‘border control’, and to have the capacity to carry on producing itself. In fact, zooming outwards from the human individual to society, rather than inwards to the single cell, one finds the same fractal pattern – the same needs – much as one might expect. Those needs and drives that we know at one level as explicit are implicit at other levels; there is no absolute, merely a relative, difference in kind as the scale changes. Lipton continues:

the biochemical mechanisms employed by cellular organelle systems are essentially the same mechanisms employed by our human organ systems. Even though humans are made up of trillions of cells ... there is not one ‘new’ function in our bodies that is not already expressed in the single cell. Virtually every eukaryote [cell that includes a nuclear membrane] possesses the functional equivalent of our nervous system, digestive system, respiratory system, excretory system, endocrine system, muscle and skeletal systems, circulatory system, integument (skin), reproductive system, and even a primitive immune system, which utilises a family of antibody-like ‘ubiquitin’ proteins.^{[132](#)}

This pattern, then, transcends scale and seems to be even universal in living entities.

ARE NEURONES, LET ALONE BRAINS, NECESSARY FOR AWARENESS?

In Chapter 12, I quoted cell biologist James Shapiro: ‘Living cells do not operate blindly: life requires cognition at all levels.’ ¹³³ I argued that single cells behave intelligently, dealing with unforeseen events, for which they could not be ‘programmed’, in ways that are original and highly adaptive. In the same chapter I quoted microbiologist Brian Ford to the effect that living cells exhibit ‘considerable ingenuity ... our conviction that these phenomena become manifest only through cell communities is a fundamental misconception. Ingenious, perceptive and intelligent behaviour is apparent in a single living cell.’ And, he continues, to the cells in the body, performing their complex daily tasks, ‘the brain is ordinarily an irrelevance.’ ¹³⁴

So where *do* brains fit in?

It seems that neither complexity of cell aggregation, nor, more specifically, neuronal complexity, is sufficient, or even necessary, for awareness. In humans, the presence of massive neuronal complexity can be insufficient for awareness; and, conversely, awareness may be fully present in its almost total absence. Though it is often argued that, in some unspecified way, consciousness emerges as a function of scale and complexity, there are further considerations that compound the already discussed formidable problems surrounding any idea of brute emergence. For example, there are thought to be an astonishing 16–26 billion neurones in the cerebral cortex; but there are a staggering 69–101 billion neurones, thus approximately four times as many, in the cerebellum. ¹³⁵ These include Purkinje cells, some of the largest and most profusely connected cells in the nervous system. ¹³⁶ Yet the cerebellum is completely incapable of supporting self-awareness – what we normally call waking consciousness. Moreover there are cases of viable human beings for whom the cerebellum is wholly absent. In any case, complexity is not always advantageous: a recent paper entitled ‘Optimal degrees of synaptic connectivity’ claims that ‘sparse connectivity is sometimes superior to dense connectivity,’ ¹³⁷ a finding that helps to explain the remarkable fact that the ‘mean number of neurons reaches a maximum at 28 weeks of gestation and then declines by

approximately 70% to achieve a stable number of neurons around birth.’¹³⁸ Note: not *to*, but *by*, 70%. It also accords with the neglected but important principle that there is an optimal level of everything, however good it may seem up to a point; and that inhibition can be as creative as excitation, and absence as presence.

As Annaka Harris points out, ‘just because the cerebellum is not responsible for the part of my brain that governs language or for the flow of consciousness that I consider to be “me,” we can still speculate that it’s *another region* of consciousness, just as we can speculate that a worm or a bacterium might be conscious.’¹³⁹ Indeed it could be argued that the entire body, every single cell, contributes to consciousness in the normal state, as long as one bears in mind that consciousness has levels.¹⁴⁰ Certain meanings of consciousness would be excluded in the absence of cortical function: principally reflexive self-awareness.

Or so we assume. In a *Science* article by Roger Lewin provocatively entitled ‘Is your brain really necessary?’, John Lorber, Professor of Paediatrics at Sheffield University, reports:

There’s a young student at this university ... who has an IQ of 126, has gained a first-class honours degree in mathematics, and is socially completely normal. And yet the boy has virtually no brain ... When we did a brain scan on him, we saw that instead of the normal 4.5 centimetre thickness of brain tissue between the ventricles and the cortical surface, there was just a thin layer of mantle measuring a millimetre or so. His cranium is filled mainly with cerebrospinal fluid ... I can’t say whether [he] has a brain weighing 50 grams or 150 grams, but it’s clear that it is nowhere near the normal 1.5 kilograms...

Professor Patrick Wall, of University College London, commented that ‘scores of similar accounts litter the medical literature and they go back a long way.’¹⁴¹ Indeed a more recent report of four children aged between 5 and 17 with hydranencephaly, a condition in which the cerebral hemispheres are very largely or totally absent and the space filled with cerebrospinal fluid, demonstrated that, despite each having minimal or practically non-existent cortex, they all nevertheless possessed

discriminative awareness: they had functional vision, could orient themselves, could distinguish familiar from unfamiliar people and environments, showed toy preferences, could interact socially, could respond to and discriminate pieces of music, and demonstrated not just awareness of their own body, but appropriate affective responses to others, as well as associative learning. One passed the ‘mirror test’, supposedly a test of self-awareness, that very few species pass.¹⁴² All of which invites the question whether neuronal complexity is necessary for awareness at all, since the remaining areas of diencephalon and brainstem amount to only 6–10% of the neuronal mass of the normal brain. Another survey of hydranencephaly concludes:

Most cortical areas are simply missing in hydranencephaly, and with them the organized system of corticocortical connections that underlie the integrative activity of cortex and its proposed role in functions such as consciousness¹⁴³ ... The evidence and functional arguments reviewed in this article are not easily reconciled with an exclusive identification of the cerebral cortex as the medium of conscious function.¹⁴⁴

Let us start at the bottom of the evolutionary heap – with slime moulds. Slime moulds, of course, have no neurones whatever. I have already discussed the complexity of their behaviour. This involves being aware of the environment in such a way as to act ‘intelligently’ on preferences, initiate sequences of behaviour that are co-ordinated and flexible, learn from experience and memorise, and produce what appear to be a complex series of transformations in the whole organism carried out at the level of individual cells, which at some stages act independently, but at others in the service of higher orders of structure of which the individual cells appear to be aware. Awareness of the environment is exhibited at several different levels, but together.¹⁴⁵

The behaviour of plants is vastly various, and can at times reach much greater degrees of complexity: awareness in what we see as the parts, and in what we see as the whole, appears so seamless as to be perhaps aspects of one larger field of awareness. Again, of course, plants have no neurones at all. Can plants learn, remember and make decisions?

The Venus flytrap can tell the difference between rain drops and the arrival of a small insect, at which it snaps shut. Clever. But can plants learn from experience? Wilhelm Pfeffer was one of the first to demonstrate in the 1870s that plants can learn, through studying the behaviour of the sensitive plant *Mimosa pudica*.¹⁴⁶ More than 50 years ago Holmes and Gruenberg demonstrated that *Mimosa* can discriminate between stimuli, in this case a finger and a drop of water. The plants initially reacted to drops of water by closing the leaflets self-protectively: with repetition they learnt there was no need to do so. Then, if the leaflets were touched with a finger, the plants responded by closing again, even though they no longer responded to a drop of water. If the habituated response to water had been due to fatigue, they would not have responded to the finger.¹⁴⁷ Rather, they could tell the difference between a familiar and unfamiliar stimulus and responded appropriately. There is an energy cost to closing, so a plant needs to weigh the relative risk of closing or remaining open quite carefully. It turns out that plants are more willing to take risks at lower light levels: when kept in artificial lighting conditions, they respond as appropriate to the diurnal light cycle in the world outside the lab.¹⁴⁸

The most comprehensive study of habituation of *Mimosa* was reported in 2014 by Monica Gagliano and colleagues.¹⁴⁹ She confirmed earlier findings by vertically dropping plants in their pots, which initially responded by closing, and then habituated (stopped reacting). Being dropped in a pot is, needless to say, not a normal historical experience for *Mimosa*. More fascinating is that plants are able to learn to make utterly new connexions which could not be foreseen in nature. Pea plants were grown in an environment where they craved light; experimentally a light would turn on for periods of time in one or another arm of a Y-shaped 'maze' above the plant. Although the side was randomly varied, for one group of seedlings air from a fan coming down the same arm as the light always preceded it; for another group, the set-up was similar, except that the air always came down the arm *opposite* to the one in which the light would subsequently appear. Having been trained over a three-day period, the plants equally learnt to predict the light from the stream of air and turned appropriately towards whichever side, in their experience, would deliver light – whether that was the same arm as the air stream, or the opposite arm.¹⁵⁰

Plant biologists Stanisław Karpiński and Magdalena Szechyńska-Hebda describe what they call the ‘life wisdom’ of plants, that is, their capacity to integrate and simultaneously read and act on stimuli of all kinds, and prioritise their responses.¹⁵¹ They can ‘store and use information from the spectral composition of light for several days or more to anticipate changes that might appear in the near future in the environment, for example, for anticipation of pathogen attack.’ To do this they need to know how to use memorised information, and to project forward; in this they adopt an approach which the authors liken to military strategy. ‘Different groups of chloroplasts and cells in the same leaf under identical constant and stable light, temperature and relative humidity condition have different opinions’ on what to do in such conditions, and try out different possibilities, ‘like different military exercisers during peace time’. However, cells and leaves exposed to a stressful excess of light have ‘one clear opinion’: to use a particular strategy as much as possible, ‘like in a real war zone’. For example, when a plant detects excess of light, it will orientate its leaves so that they are side-on to its source, in such a way as to limit damage. Plants, they conclude, as many other plant biologists have done, ‘can actually think and remember.’¹⁵²

Plants can discriminate more sustained signals from transient background noise,¹⁵³ using both spatial and temporal cues to identify relevant information.¹⁵⁴ Indeed they respond to roughly 15 environmental factors acting simultaneously to different extents and each modulating the other.¹⁵⁵ According to philosopher Michael Marder, the result is ‘infinite variations of selectively variable responses.’¹⁵⁶ Flexibility is an important and sophisticated feature. A plant forms enduring memories of past events, recognises stimuli, and then generalises from what it has learnt to new contexts.¹⁵⁷ However, it must also be able to select what is relevant to memorise, to focus on ‘the important information in its environment, while filtering out stimuli or events that, over time, have repeatedly proven to be irrelevant and innocuous’, and thus to select those memories it most needs in order to ‘modify the timing, quality or quantity’ of its response to the prevailing circumstances.¹⁵⁸ Discernment is ‘a key feature of intelligence’, writes Marder, and he gives the example of a plant’s ability to differentiate between damage from insect feeding and a mechanically induced wound, and respond appropriately.¹⁵⁹ Plants assess when to bloom, weighing

different factors, not just reacting automatically to, say, temperature.¹⁶⁰ ‘If consciousness literally means being “with knowledge”, then plants fit the bill perfectly’, says Marder.¹⁶¹

Plant memory is not an abstract representation of, eg, light, but a capacity to draw on ‘the actual photon energy absorbed in excess by some leaves to improve the chances of survival for the whole plant ... in the future.’¹⁶² Plants, at least according to Marder, also attend – and indeed pay different *types* of attention. ‘Plant attention is active, rather than merely contemplative’, and, according to him, plants exhibit focal attention, and attention to the periphery, as well as both selective attention and sustained attention.¹⁶³ According to František Baluška, Professor of Cellular and Molecular Botany at Bonn University, ‘it is well known that stress perceived at one site is rapidly communicated through the whole plant body.’¹⁶⁴ Plants communicate internally from one focus of attention to other tissues not directly affected by the stimulus, or co-ordinate the many different attentive foci, ‘each of them singling out a vital piece of information about environmental conditions – often, by way of parallel processing, as in the case of leaf photosensitivity.’¹⁶⁵

Plants are by no means the immobile and passive entities they have been taken to be. They actively ‘forage’ for light, water and nutrients. ‘Foraging behaviours in plants are highly selective. They are accompanied by attention to numerous environmental factors, foremost among them resource availability and the presence or absence of competitors’, writes Marder.¹⁶⁶ Such movement ‘isn’t just adaptive behaviour, it’s anticipatory, goal-directed, flexible behaviour’, writes one researcher, Paco Calvo. And he points out that plants ‘do things so slowly, that they can’t afford to try again if they miss’.¹⁶⁷ Although generally rooted in place, they develop and reform themselves both above and below ground. Animals usually move quickly; mountains, although they move, do so slowly; plants are somewhere in between. Time-lapse photography reveals how coherently, and purposively, plants appear to move. When animals intend something, they move their muscles; when plants intend something, they grow and change their form.¹⁶⁸ Vines grow more rapidly and redirect their growth once they sense a nearby anchor. Plants detect and react to different sounds, bending root tips toward a sound source¹⁶⁹ and can detect the presence of water by sound, as well as by sensing moisture directly: their detection is

susceptible to being disrupted by environmental vibration and noise.¹⁷⁰ ‘Intact growing root apices can, under appropriate circumstances, perform crawling-like searching movements, which closely resemble the type of behaviour of a lower animal’, write Baluška and colleagues.¹⁷¹

The importance of the root tip is something Darwin addressed in one of his last works, *The Power of Movement in Plants*, published in 1880. ‘It is hardly an exaggeration’, he wrote, ‘to say that the tip of the radicle ... having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals.’¹⁷² He drew attention to the way in which plants explore possibilities through what he called ‘circumnutation’, a slowly spiralling movement affecting all parts of the plant, including the roots. The turns would be generally slightly asymmetric, describing ellipses:

If we look, for instance, at a great acacia tree, we may feel assured that every one of the innumerable growing shoots is constantly describing small ellipses; as is each petiole, sub-petiole, and leaflet ... If we could look beneath the ground, and our eyes had the power of a microscope, we should see the tip of each rootlet endeavouring to sweep small ellipses or circles, as far as the pressure of the surrounding earth permitted. All this astonishing amount of movement has been going on year after year since the time when, as a seedling, the tree first emerged from the ground.¹⁷³

This enables trees, and plants in general, to perceive, and to respond by appropriate motion to their perceptions. ‘Their world-construction is accomplished in common’, writes Marder.¹⁷⁴ For example, ‘in a drought, specimens of *Pisum sativum* communicate the onset of adverse environmental conditions through biochemical messages emitted by the roots to other pea plants unaffected’.¹⁷⁵ He further argues that because plants communicate with one another, defend their health, and make decisions, among other things, they may well have some sense of self, too.¹⁷⁶

Evolutionary ecologist Monica Gagliano insists that plants are intelligent: ‘When I talk about learning, I mean learning. When I talk about memory, I mean memory.’ Despite having no nervous system they behave

like intelligent beings. She says that if plants can summon knowledge about an experience repeatedly – as was the case with the potted plants that stopped curling their leaves after they learnt they would come to no harm – then plants are clearly able to remember and learn from experience.¹⁷⁷ Philosopher Michael Marder concludes: ‘Plants are definitely conscious, though in a different way than we, humans, are.’

While it would be improbable that all scientists agree with these voices, since the orthodoxy of current science is set firmly against such ideas, there are increasing numbers who do.¹⁷⁸ It is by now established that trees form communities of a kind, communicate with and support one another as they grow, warn one another of impending threats, and even share nutrients with those who are sick or struggling.¹⁷⁹ The ecologist Suzanne Simard discovered that two tree species she was studying, the Douglas-fir and paper birch, shared what are called mycorrhizal networks, complex underground networks of fungi that connect individual plants, and are capable of transferring water, carbon, nitrogen, and other nutrients and minerals. The species were engaged ‘in a lively two-way conversation’. In the summer months, when the Douglas-fir needed more carbon, the birch sent more carbon to the fir; and at other times when the fir was still growing but the paper birch needed more carbon because it was leafless, the fir sent more carbon to the birch. The two species were in fact interdependent.¹⁸⁰ Apparently Douglas-fir ‘mother trees’ are able to distinguish between their own kin and a neighbouring stranger’s seedlings:

Simard found that the mother trees colonized their kin with bigger mycorrhizal networks, sending them more carbon below ground. The mother trees also ‘reduced their own root competition to make room for their kids’, and, when injured or dying, sent messages through carbon and other defence signals to their kin seedlings, increasing the seedlings’ resistance to local environmental stresses.¹⁸¹

None of all this is as surprising as it appears unless one makes the mistake of believing that only human beings and perhaps a handful of what we call ‘higher’ animals have awareness. It seems that plants, like animals, use complex calcium-signalling networks and ‘neurotransmitters’. The

stimulation of a plant cell leads to changes that result in an electrical signal – similar to the reaction caused by the stimulation of nerve cells in animals – and ‘just like in animals, this signal can propagate from cell to cell, and it involves the co-ordinated function of ion channels including potassium, calcium, calmodulin, and other plant components.’¹⁸² What has been called plant neurobiology, according to Baluška and colleagues, ‘neatly closes the gap between animals/humans and plants ... Both animals and plants are non-automatic, decision-based organisms. Should Charles and Francis Darwin have witnessed these unprecedented discoveries, they would surely have been pleased by them.’¹⁸³

Gagliano and colleagues conclude that ‘brains and neurons are just one possible, undeniably sophisticated, solution, but they may not be a necessary requirement for learning.’¹⁸⁴ What about single cells? I have written already about the way in which cells are described as making decisions based on assessing a multitude of sources of information. We saw that amoebas and slime moulds are able to learn from experience and exhibit apparently purposeful behaviour – sometimes to a level that astonishes any observer whose mind is not firmly closed to the possibility that there is a form of awareness here, different of course in nature and extent from our own. Is this magic? Not at all. Though it remains awe-inspiring, it is not in conflict with what we know about cell life. To quote Lipton, a large number of recent scientific studies have confirmed that

‘invisible forces’ of the electromagnetic spectrum profoundly impact every facet of biological regulation. These energies include microwaves, the visible light spectrum, extremely low frequencies, acoustic frequencies, and even a newly recognised form of force known as scalar energy. Specific frequencies and patterns of electromagnetic radiation regulate DNA, RNA, and protein syntheses; alter protein shape and function, and control gene regulation, cell division, cell differentiation, morphogenesis (the process by which cells assemble into organs and tissues), hormone secretion, and nerve growth and function.¹⁸⁵

In doing so, ‘signals released by cells into the environment allow for a co-ordination of behaviour among a dispersed population of unicellular

organisms. Secreting signal molecules into the environment enhanced the survival of single cells by providing them with the opportunity to live as a primitive dispersed “community”.’¹⁸⁶ All of which is perfectly in keeping with the way in which plants are able to exhibit responses that require co-ordination within and between organisms.

The question of what it is like to be such a single-cell creature is impossible to answer. Its level of awareness can be neither finally affirmed nor denied. Do plants have experientiality? I believe it is both a reasonable and an intuitively compelling assumption that they do. It may be said, quite correctly, that a computer can be programmed so as to learn, remember and make decisions. But that capacity comes from a human being’s cleverly externalising an image of such faculties, faculties which come from consciousness whose origins we do not know, and creating a system that appears ‘intelligent’. There is no need to suppose experientiality – inwardness – driving this process. In plants, however, we have what look like human faculties appearing in something that was never programmed, but ‘programmes’ itself – making its ‘programme’ in the act of making itself. This is extraordinary. Plants appear to be driven to survive, adapt, and help other members of their species just as we are. Even single cells have such drives.

Coming further up the evolutionary tree, it is worth quoting Darwin on earthworms. He notes that in their assessment of how to solve problems relating to different sizes of leaves and the different shapes of their burrows, and how to get the one into the other, they ‘act in nearly the same manner as would a man under similar circumstances’; and he continues, having dismissed either instinct alone or simple exhaustive trial and error,

One alternative alone is left, namely, that worms, although standing low in the scale of organization, possess some degree of intelligence. This will strike every one as very improbable; but it may be doubted whether we know enough about the nervous system of the lower animals to justify our natural distrust of such a conclusion.¹⁸⁷

Fish injected with a substance thought to cause pain will preferentially swim into water containing a pain-killing substance, even though it is in

other respects an ‘unpreferred environment’: they will not swim there if it does not contain such a substance. ‘They made a choice they’d not normally make’, writes philosopher Peter Godfrey-Smith, ‘and they made it in a situation where the idea of a more painful or less painful *environment* would be quite novel to them: evolution could not have set them up with a reflexive reaction to this situation.’¹⁸⁸ Crabs, and some shrimps, nurse injured limbs and groom injured areas. ‘You can still doubt that these animals feel anything, yes. But you can doubt that about your next-door neighbour. Scepticism is always possible, but a case is being built here. These results do provide support for a view of pain as a basic and widespread form of subjective experience, one present in animals with very different brains from ours.’¹⁸⁹

Godfrey-Smith contrasts what he calls the ‘latecomer’ and ‘transformer’ views of experience – in other words, the view that consciousness somehow emerged late in evolution versus the view that consciousness was never absent but was transformed during evolution.¹⁹⁰ And he points out that if you are an adherent to the ‘latecomer’ story, not only do you have the problem attaching to the magic trick of brute emergence, but you have to perform the magic trick several times over. He establishes to his satisfaction, and I believe convincingly, that crabs, octopuses, and cats have consciousness. ‘By the Cambrian’, he continues,

the vertebrates were already on their own path (or their own collection of paths), while arthropods and molluscs were on others. Suppose it’s right that crabs, octopuses, and cats all have subjective experience of some kind. Then there were at least three separate origins for this trait, and perhaps many more than three.’¹⁹¹

Indeed like octopuses, other creatures such as honeybees and spiders have perceptual constancy, that is to say, the tendency to recognise from a percept that varies in its shape, brilliancy and size a nonetheless constant, familiar object.¹⁹² Honeybees and spiders can perform elementary arithmetical calculations.¹⁹³ Crows can remember individual human faces for several years after a single encounter, respond appropriately to different people and are capable of solving new logical problems consisting of up to eight steps, including avoiding deliberate distractor ‘tools’ that do not

function.¹⁹⁴ Ravens can plan flexibly, barter and teach their offspring how to use tools.¹⁹⁵ As birds have no neocortex, clearly cortical processing cannot be a requirement for higher-order cognition.¹⁹⁶ Although birds have more neurones than expected from their small brain weights,¹⁹⁷ their absolute neurone count is still low compared to cortical neurone numbers in primates. Yet in, for example, abstract numerical competence and visual memory tasks pigeons reach performance levels comparable to those of macaques,¹⁹⁸ and in some cognitive tasks they can outperform humans;¹⁹⁹ corvids can outperform pigeons, primates and humans at some cognitive tasks.²⁰⁰ While affirming that brain size increases in more intelligent creatures, Darwin rejects the idea that there need to be elaborate neuronal ganglia for consciousness and cognition:

It is certain that there may be extraordinary mental activity with an extremely small absolute mass of nervous matter: thus the wonderfully diversified instincts, mental powers, and affections of ants are generally known, yet their cerebral ganglia are not so large as the quarter of a small pin's head. Under this latter point of view, the brain of an ant is one of the most marvellous atoms of matter in the world, perhaps more marvellous than the brain of man.²⁰¹

Before we conclude that it is absurd to suppose that other organisms, perhaps far removed from us in terms of evolutionary history, have awareness, let us remember that the detached post-Enlightenment view of life as mechanical, and of consciousness as something we must not make the mistake of attributing to any creature other than ourselves, on the basis that to do so is to make assumptions we cannot validate, is both historically anomalous and illogical. Historically anomalous, because such a view would never have been accepted by Greek or Roman, Chinese or Indian philosophers, or our own, until Descartes. Illogical, because to assume that they do not have awareness is also an assumption we cannot validate, but which, unlike its alternative, does violence to every other human faculty.

And it is an assumption with a far from glorious history. Descartes affirmed that 'in my view pain exists only in the understanding. What I do explain is all the external movements which accompany this feeling in us; in animals it is these movements alone which occur, and not pain in the

strict sense.’²⁰² This idea made it easier to excuse animal experimentation without anaesthesia, which persisted for hundreds of years. I was shocked to learn from an anaesthetist during my medical training that human infants were operated on well into the 1980s without anaesthetics, because, unable to verbalise their pain, they were clearly not capable of feeling it.²⁰³ Their screams and cries were like those of animals, creakings of a machine. This practice was perpetuated, and given credence, by an influential paper by the psychologist Myrtle McGraw, published in 1941, which promoted the idea that infants do not experience pain.²⁰⁴ It was not until 1987 that the American Academy of Pediatrics issued a declaration that it was no longer ethical to perform surgery on preterm babies without anaesthetics; a declaration in which they confirmed that ‘hospitalized newborns, from preemies to babies up to 18 months of age, have been routinely operated upon without benefit of pain-killing anaesthesia. This has been the practice for decades.’²⁰⁵ However babies’ brains react in 18 out of 20 regions that adult brains do to pain,²⁰⁶ and it is deeply perverse to deny that they experience suffering, as I believe it is to deny outright the possibility of suffering to any living being.

Let us beware of what Sydney Brenner calls Occam’s Broom, a device that helps one sweep under the carpet any findings that cast doubt on the current paradigm. Brenner, who won a Nobel Prize for his work in molecular biology wrote:

Molecular biology has been a great leveller and has made thinking unnecessary in many areas of modern biology ... So powerful are contemporary tools for extracting answers from nature that pausing to think about the results, or asking how one might find out how cells really work, is likely to be seen as a source of irritating delay to the managerial classes, and could even endanger the career of the questioner ... I found that many people were applying what I called Occam’s Broom, which was used to sweep under the carpet any unpalatable facts that did not support the hypothesis ... The orgy of fact extraction in which everybody is currently engaged has, like most consumer economies, accumulated a vast debt. This is a debt of theory and some of us are soon going to have an exciting time paying it back – with interest, I hope.²⁰⁷

SO WHY BRAINS AT ALL?

There can be no doubt that brains serve an important role in the evolution of higher levels of consciousness, though no-one knows how. There are tantalising clues that what enables consciousness to cohere in the brain may be aspects of quantum field theory, but this area lies beyond (my) non-specialist grasp. According to Matthew Fisher, Professor of Physics at the University of California at Santa Barbara, the nuclear spin of phosphate atoms could serve as rudimentary quantum bits (so-called ‘qubits’) of information in the brain, since such phosphate atoms, bonded with calcium in Posner molecules (clusters of nine calcium atoms and six phosphorus atoms), can prevent coherent neural ‘qubits’ from collapsing into decoherence (non-quantum states) for long enough to enable the brain to function somewhat like a quantum computer.²⁰⁸ As far as entanglement goes, it was always said that entanglement was difficult enough to observe under laboratory conditions and at very low temperatures, never mind at room temperature and in the soggy environment of the brain, but this now seems to be much less serious an objection than it was once thought to be. Quantum entanglement could co-ordinate processing in many different parts of the brain simultaneously.²⁰⁹ According to Fisher, ‘if we find that quantum mechanics is in operation cognitively, then it could be a necessary component of consciousness’.²¹⁰

Another implication of entanglement is that it might underlie the collapse of the wave function, which is not a *mechanical* effect of consciousness on the system; it could be the outcome of the observer’s brain and the observed system becoming entangled in consciousness.²¹¹ Quantum theory, which Stapp uncontroversially describes as a ‘hugely successful rational approach that yields validated predictions of high accuracy ... involves, in an essential way, the causal participation of the minds of us observers, while classical mechanics strictly bans any such effect of mental realities on the world of matter.’²¹² It differs from classical physics in attributing a key role in the actualisation of one particular potential (out of a range of potentials) to the agency of the observer. ‘What a person’s brain does’, he writes,

can, according to the quantum theory, be strongly influenced by a nonlocal causal process connected to the person's conscious choices and mental efforts. Consciousness can play a nonredundant causal role in the determination of our actions: it can play the very role that we intuitively feel that it plays. Quantum theory allows your mind and your brain to co-author your physical actions.²¹³

Note 'co-author': since brain and mind interact, each will be causative of our behaviour. And as Denis Noble says: 'Agency is central to understanding life.'²¹⁴

Remember Stapp's statement that 'quantum mechanics is explicitly designed to cover "big" systems, and by becoming "big" a quantum system does not become classical.'²¹⁵ Quantum effects are involved in photosynthesis, as well as migration in birds through magnetoreception.²¹⁶ Physicists Andreas Albrecht and Daniel Phillips explain that 'the quantum nature of fluctuations in the gasses and fluids around us can lead to a fundamental quantum basis for probabilities we care about in the macroscopic world.' They assert that 'the randomness in collections of molecules in the world around us has a fully quantum origin ... We expect that all practical applications of probabilities can be traced to this intrinsic randomness in the physical world', so that, eg, 'the outcome of a coin flip is truly a quantum measurement (really, a Schrödinger cat)'. Unpredictability is a physical reality embedded in the fabric of the quantum world. And it starts to make itself felt not in one or two rare circumstances, but in those of everyday. To give some idea of this, they take the case of ricocheting billiard balls, the perfect image of Laplacian determinism, and show by calculation 'the number of collisions after which the quantum spread is so large that there is significant quantum uncertainty as to which billiard takes part in the next collision.' Several million, perhaps? No, just *eight*.²¹⁷

Based on von Neumann's orthodox mathematical formulation of quantum mechanics, Stapp describes a two-stage process, likened to a 'questioning and response', between the observer and the rest of nature, in which one part of the process involves freedom from determination. As a result of the 'question asked' by the observer there is a 'proliferation in the brain of representations of many different possible immediate courses of action', which then collapse into one single actuality as a result of the

interactive process.²¹⁸ In mechanistic terms, Stapp hypothesises that the necessary dynamic uncertainty is introduced by the quantum-indeterminable action of single ions (eg, calcium ions) passing through ion channels in neuronal membranes and resulting in the release (or not) of neurotransmitters at the synaptic cleft. ‘Thus the pertinent-for-us essence of quantum mechanics is the causal dynamical linkage that quantum mechanics specifies between our conscious thoughts and our atomic-particle-based brains.’²¹⁹ This quantum uncertainty is played out at each of the quadrillions of synapses active in the brain – rather more than eight. Stapp’s model ‘makes consciousness causally effective, yet it is compatible with all known laws of physics, including the law of conservation of energy’.²²⁰

‘The empowering message of quantum mechanics’, he concludes,

is that the empirical data of everyday life, and also our intuitions, are generally veridical, not delusional; and hence that our mental resolves can often help bring causally to pass the bodily actions that we mentally intend. The role of our minds is to help us, not to deceive us as the materialist philosophy must effectively maintain.²²¹

That consciousness interacts with matter, an insuperable problem in the seventeenth century, is no longer insuperable, since matter is already intrinsically a field that interacts with a field of consciousness. Additionally fields affect matter ‘at a distance’ all the time: gravity, accepted by Newtonian mechanics, is just one instance, and since Newton’s time we have become familiar with electromagnetic forces and other types of force fields, which, while not tangible, cause rearrangements in the form of matter. It is not incomprehensible that such fields of force in consciousness affect matter, and it would perhaps be harder to account for if they did not.²²² In any case it is not disputed that observation changes the nature of matter, and not just in some ‘incidental’ fashion.

At the end of the nineteenth century Schiller had written of action at a distance that ‘the objection to it seems nothing but the survival of the primitive prejudice that all action must be like ... a tug-of-war. If metaphysics had been consulted, it would have been obvious that no special

medium was required to make interaction possible between bodies that *co-exist*, seeing that their co-existence is an ample guarantee of their connexion and of the possibility of their interaction.’²²³ Here again Schiller’s metaphysics seem to have anticipated modern physics. Princeton physics philosopher Hans Halvorson has concluded that a form of ‘superentanglement’ links every aspect of everything in the universe.²²⁴

Nor is there any lack of everyday evidence that changes wrought in the mind have material effects. The evidence that mind and body are inextricably interrelated, with reciprocal effects on one another, is an everyday experience for a physician, yet the philosophical implications of that fact are seldom recognised. Note not just *brain* and body (viz, ‘body and body’), but *mind* and body. The belief that a substance will produce a cure (placebo) – or harm (nocebo) – is a potent predictor that it will do so even if the substance is inert.²²⁵ Although it is one of the most familiar and best attested phenomena in medicine (and one of the most reliable and effective), the mechanism by which the placebo operates has been little researched, for, I suspect, three main reasons: there is no money in it for drug companies – perhaps the reverse; it is an embarrassment to the reductionist materialist mainstream in biological research; and there is little chance of a mechanism being found any time soon. Recent reviews of the phenomenon demonstrate the chasm open between the silence of neuroscientists when contemplating the interaction between mind and brain, and their fluency when on home ground, dealing with the brain and body as a closed system.²²⁶ Attempts to ‘find consciousness in the brain’ are inevitably driven by this home ground fluency, and leave the problem of the chasm unaddressed.

Hypnosis would appear to present similar difficulties, since simple suggestion can produce a whole range of physiological changes, even causing, or alternatively preventing, an allergic skin reaction.²²⁷ Equally hypnosis can in many cases help clear skin conditions (and of course help treat many other conditions).²²⁸ Autosuggestion and the enacting of imaginary scenarios have measurable effects on body functions. A report of the US National Research Council on behalf of the military found that mental practice was almost as effective as physical practice in the acquisition of motor and other skills.²²⁹ None of all this would surprise a psychiatrist. Indeed something as well-validated as cognitive therapy²³⁰

could not work, according to the materialist hypothesis, unless beliefs were able to change the brain, as they evidently do.²³¹ The dogma that while matter can affect mind, mind cannot affect matter is irrational and baseless. The brain can be altered by changes in the mind, which accords with an array of neuroscientific findings, just as the mind can be altered by changes in the brain.

A recent case report of a woman with multiple personality disorder is interesting. The woman exhibited a variety of dissociated personalities ('alters'), some of which claimed to be blind. On EEG, the brain activity normally associated with sight was not present when a blind alter was 'in control', even though her eyes were open: when a sighted alter assumed control, the usual brain activity returned. The authors note that 'visual evoked potentials were absent in the blind personality states but were normal and stable in the seeing states. A switch between these states could happen within seconds.' The authors of the report 'assume a top-down modulation of activity', of the brain by consciousness.²³²

The most contentious area is that of so-called 'paranormal' phenomena, such as extra-sensory perception, telepathy, psychokinesis, near-death experiences, remote viewing, presentiment, etc. Partly because of my lack of a thorough enough familiarity with the evidence, and partly because it risks triggering the descent of a red mist in otherwise rational and well-disposed readers, I will not deal with it: to do so fairly would surely demand a book-length review of the evidence, and one I could not write. However, for the sake of the progress of science, as much as anything else, nothing should be denied fair scientific investigation, and the difficulty seems to be that to accord it such would require years of hard work that very few people can afford, since the price would be exclusion from the 'serious' scientific community. Those who have genuinely accepted the challenge with an open mind are worth reading: they do not generally reach the conclusion that it is safe to dismiss the evidence. Such are the writings of the systematic, analytic philosopher CJ Ducasse;²³³ and a recent review by neuroscientist Mario Beauregard and colleagues which reaches the conclusion that there is a convergence of evidence suggesting that we should take what they call post-materialist hypotheses seriously.²³⁴ Clearly the danger is that one defines as 'normal' only the things that one happens to believe now: and everything else becomes, by definition, abnormal, paranormal, supernatural, irrational.

Paul Nuñez, a biomedical engineer who specialises in the physics of brain function, writes that

an appreciation of the grand conceptual leap required in the transition from classical to quantum systems may give us some vague feeling for how far from current views neuroscience may eventually lead. Such humbling recognition will perhaps make us especially sceptical of attempts to ‘explain away’ (that is with tautology) data that do not merge with common notions about consciousness, such as multiple conscious entities in a single brain, hypnosis, and so on. [235](#)

Social psychologist Roy Baumeister, looking at the question at a different level from physicists, writes, in a review:

The evidence for conscious causation of behaviour is profound, extensive, adaptive, multifaceted, and empirically strong. However, conscious causation is often indirect and delayed, and it depends on interplay with unconscious processes. Consciousness seems especially useful for enabling behaviour to be shaped by non-present factors and by social and cultural information, as well as for dealing with multiple competing options or impulses. It is plausible that almost every human behaviour comes from a mixture of conscious and unconscious processing. [236](#)

Almost all actions evolve out of a nexus of wishes, desires, emotions, imaginings, intuitions and explicit acts of cognition, each playing a part at some stage. Some of these elements will be conscious, though most unconscious, and of course they may come and go from conscious awareness at different times. In the broader usage of consciousness employed so far, both self-awareness and awareness at any level are included. These streams emerge out of ‘the field of me’.

The brain and free will

I am sometimes asked when I wrote a particular book. I might reply with the year of publication. But when did I begin to write it – and when did I decide to write it? When I typed the long since discarded first words? When I started writing down disparate thoughts that tended to its topic? When I, much earlier, started reading about related matters? When I first had certain insights as a teenager that inspired me to follow certain paths of thought and research? When I had that conversation with a friend? There is no answer to this question. Much of the work was done unconsciously, but it would be normally accepted that a book has an author or authors, and that author in this case was me. It may be thought that this is a special case, but it is only a clear one. When and how did I decide to go for a walk today rather than tomorrow? I can't unravel things to reveal a moment when I did. There are many possibilities and they collapsed into a certain single event at a certain moment when I put on my boots. I am both my unconscious and my conscious mind. When the decision comes it comes out of, or at least, through me.

The classic experiments are those carried out by Benjamin Libet in the 1980s. He asked volunteers, who were monitored by an EEG, to press a button 'at random', and record the moment at which they made the decision to act. Since the 1960s it had been known that there is a characteristic event in the EEG called the 'readiness potential' (*Bereitschaftspotential*), which was thought to mark the beginning of the train of events leading to an action. What he found was that the readiness potential was evident about half a second *before* the subject decided to act: spooky! This led to all kinds of wonderful claims, such as that 'I' am an illusion, or that my brain makes decisions in which 'I' play no part, but for which 'I' later ignorantly take credit. Estimates by experimental subjects of when they think they decided to carry out an action indicate only the timing of when they came to have a belief about when they became aware of a conscious immediate intention to act. In the famous Libet experiments, subjects were instructed at the outset that they would be making choices to move a finger, and so they and their brains were at all times in a state of meta-readiness to *decide when to make that decision*.

There are many other problems with the Libet experiments. Recording the 'moment' of a decision is intrinsically difficult and doing so while reading a clock accurately makes it harder to be sure one knows what one is recording at exactly which point. Moreover, it turns out that the readiness

potential occurs frequently without heralding action, and its apparent prominence may be the consequence of studying only cases in which, by definition, it did. It may signal the brain gathering evidence for or against action, rather than initiating action. In fact it is certainly not simply causative of anything at all. It may be an artefact of a highly artificial situation in which subjects have been told to resist all obvious reasons for movement and produce a random event (therefore, unusually, coming to rely on a symmetry-breaking event of some kind). Furthermore in a study of monkeys tasked with choosing between two equal options, the monkey's choice correlated with brain activity before the monkey had even been presented with options.²³⁷ With a control condition of periods of inaction, scrutiny of the EEG alone could not distinguish between action and non-action conditions. In a modified version of the Libet experiments, subjects showed a readiness potential when they decided *not* to move.²³⁸ In yet another variation, in which subjects were asked to press one of two buttons in response to images on a computer screen, they showed a readiness potential even before the images came up on the screen, suggesting that it was not related to deciding which button to press.²³⁹ And, to crown it all, the readiness potential is found in an area of the brain, the supplementary motor area (SMA), which is normally activated by imagining, not initiating, movements (which is associated with more posterior cortical regions).²⁴⁰ Neither Hans Helmut Kornhuber nor Lüder Deecke, who discovered the *Bereitschaftspotential*,²⁴¹ nor Benjamin Libet, believed they had disproved free will – which is just as well, because they hadn't. This has not stopped 'science has proved we have no free will' getting firmly lodged in the popular imagination. The design of Libet's experiment was so poor that its renown could not have lasted as long as it has except for its conclusion being in keeping with the orthodox materialist dogma. By contrast some of the experiments on psychical phenomena are amongst the most stringently designed and meticulously executed in the field of psychology, but because of their clear indication of an effect of consciousness on matter, which though quantitatively small has been repeatedly demonstrated to be of statistically very high significance, they have been ignored or dismissed rather than falsified, because their conclusions question the consensus view.²⁴²

Above all, 'I' am not confined to my reflexive awareness of my decisions. Most of our decisions to act have little reflexive awareness to

them at all. But, significantly, many of our more important decisions to act do. That such reflexive awareness is only sometimes required is not to say that when required it is not effective. Much of the time I remain warm without lighting a fire; that doesn't mean that when I do light a fire it is ineffective in keeping me warm. And, when required, reflexive awareness does not have to be unmixed with unconscious thoughts. As Baumeister says, 'any evidence that conscious thoughts are themselves the results of other causes (presumably including unconscious processes and brain events) is irrelevant.' The immediate cause of movement is *always* an action potential in a motor axon, which is unconscious. 'The proper question is whether the conscious processes can play any causal role' in that chain.²⁴³ And they manifestly can.

Mozart was quite unaware of where his music came from; Poincaré was taken by surprise by his sudden revelation of Fuchsian functions. Neither came as acts of will. Yet we do not suppose that Mozart and Poincaré could have done what they did had they been zombies, beings without consciousness. In the sense examined by Libet, consciousness is just the individual's attentional spotlight; but it passes over a massively larger field of awareness, existing at many levels. It's good that it's on somewhere; but it doesn't have to be shining on our chosen place of interest for us to be there. And if we are doing many things simultaneously – imagine playing an organ fugue, requiring the working of ten fingers and two feet – the searchlight having only one focus, it would be logically impossible for it to be on them all. (In any case, if the performance is to be a success, it must be on none of them.) That does not prevent them being *our* actions, rather than suddenly becoming something 'decided' on by individual neurones themselves.

I am working my way towards the question what consciousness is for. But first, we should return to the nature of the role played by the brain in consciousness. It might give us a clue.

I started by suggesting that everything we know about the brain would be compatible with it acting in an emissive, transmissive or permissive capacity. I then gave some reasons for doubting that the brain somehow generates consciousness. The engineer and inventor Nikola Tesla is said to have said: 'My brain is only a receiver. In the universe there is a core from which we obtain knowledge, strength, inspiration. I have not penetrated into the secrets of this core, but I know that it exists.' Of course, his hunch may

be wrong, but it expresses a healthy scepticism about the idea that consciousness *starts out* in neurones. Paul Nuñez writes that ‘whole brains or special parts of brains might behave like antenna systems sensitive to an unknown physical field or other entity that, for want of a better name, may be called Mind.’²⁴⁴ When Strawson says ‘there is a lot more to neurons than physics and neurophysiology record (or can record)’ – a view with which I wholly concur – he nicely leaves the door open as to what that unrecordable element might be.²⁴⁵ There can be no question that reality is more than we can see or measure or know precisely. But this does not mean a speculative free-for-all. The principles of Pragmatism apply: only what answers best to experience as a whole will pass. What does experience suggest?

PERMISSION

‘How do you know but ev’ry Bird that cuts the airy way, is an immense world of delight, clos’d by your senses five?’, wrote Blake.²⁴⁶ An interesting phrase, because we normally think of the senses as openings on the world. I suggest that the function of the brain is to create by permission, in other words by acting as a kind of filter. This includes the idea of transmission but adds a further element. Consciousness is sculpted: by saying ‘no’ to some things it enables others to stand forward into being, as Michelangelo’s hand caused his David to come into being by a process of discarding stone from the formless block and allowing other stone to remain. Cells are the most primitive life forms, and they already define themselves by an exercise of coming into being through permission. The cell membrane is a (highly active) *semi-conductor*: it conducts some things across, while keeping some things out.²⁴⁷ This is what makes it possible for the cell to exist, to persist, and to embody a purpose. The membrane both says ‘no’ and does not say ‘no’. It doesn’t make the cell happen, but permits it to come into being – it is its ground of possibility. In a vastly complex organism such as the human being, what we see on the small scale is fractally expressed on a much larger scale. Lipton writes:

While it is the job of the membrane in a single cell to be aware of the environment and set in motion an appropriate response to the environment, in our bodies those functions have been taken over by a specialised group of cells we call the nervous system. It is not a coincidence that the human nervous system is derived from the embryonic skin [the ectoderm], the human counterpart of the cell’s membrane.²⁴⁸

This already casts the idea of the nervous system as a permissive and non-permissive system – a filter of sorts. With this in mind, here is James:

when we think of the law that thought is a function of the brain, we are not required to think of productive function only: we are entitled also to consider permissive or transmissive function. And this the ordinary psychophysicologist leaves out of his account.

Invoking Shelley's timeless image of life as a 'dome of many-coloured glass that stains the white radiance of eternity', James implies that consciousness is given its particular unique quality in each living being by a process of filtering or shaping, carried out by the brain, of the formless, featureless condition in which it otherwise would exist; much as the air passing through his vocal chords is limited and restricted in such a way as to 'shape it into my personal voice'.²⁴⁹ Limitation is intrinsic to creation. Elsewhere he actually used the metaphor of sculpture: 'the mind ... works on the data it receives very much as a sculptor works on his block of stone'.²⁵⁰

Schiller had the same intuition. 'Matter is not that which *produces* consciousness', he wrote, 'but that which *limits* it and confines its intensity within certain limits: material organisation does not construct consciousness out of arrangements of atoms, but contracts its manifestation within the sphere which it permits.'²⁵¹ In fact he saw the brain as 'admirably calculated machinery for regulating, limiting and restraining the consciousness which it encases'. And he has this interesting reflection to make:

if, eg, a man loses consciousness as soon as his brain is injured, it is clearly as good an explanation to say the injury to the brain destroyed the mechanism by which the manifestation of consciousness was rendered possible, as to say that it destroyed the seat of consciousness. On the other hand, there are facts which the former theory suits far better. If, eg, as sometimes happens, the man after a time more or less recovers the faculties of which the injury to his brain had deprived him, and that not in consequence of a renewal of the injured part, but in consequence of the inhibited functions being performed by the vicarious action of other parts, the easiest explanation certainly is that after a time consciousness constitutes the remaining parts into a mechanism capable of acting as a substitute for the lost parts.²⁵²

This is a point that has not been much discussed. How does consciousness as a whole have a sense of functions that have gone missing

and try to re-instigate them – somewhere – in the brain? Schiller's point is worthy of serious debate, if nothing else.

Bergson, similarly, thought that 'if consciousness is not a function of the brain, at least the brain maintains consciousness fixed in the world in which we live; it is the organ of attention to life'. The perception that attention was central is of critical importance. He thought, like Schiller, that in the case of brain injury, 'the mechanism is thrown out of gear', so that its properly limiting function is deficient, and certain aspects of thinking are no longer capable of being shaped into being. When functioning well, the brain 'canalises, and also limits, the life of the mind.' The part the brain plays 'is that of shutting out from the field of our consciousness all that is of no practical interest to us, all that does not lend itself to our action.'²⁵³

Interestingly, suppression of the left medial frontal cortex has been found experimentally to increase significantly a subject's ability to influence the numerical output of a random event generator. An arrow moving at random on the screen, as the output of the random number generator dictated, was influenced to make significantly more movements in the 'contralesional' direction, namely towards the right. The authors conclude: 'The medial frontal lobes may act as a biological filter to inhibit *psi* [phenomena that are anomalous according to contemporary orthodoxy] through mechanisms related to self-awareness.'²⁵⁴ Feelings of self-transcendence follow *damage* to either left or right parietal region.²⁵⁵ Philosopher Bernardo Kastrup, who also supports the filter hypothesis, offers evidence from 10 different kinds of psychological phenomena.²⁵⁶ One study he reports, of mediums writing during a trance, compared with writing under normal conditions, showed marked reduction of brain activity in key regions such as the frontal lobes and hippocampus.²⁵⁷ When the written material was later scored for complexity, however, the material written under trance scored consistently higher than material produced without trance. One would conventionally expect more complex material to be associated with increased activity in the frontal and temporal lobes, not decreased activity.

There is also a phenomenon known as 'terminal lucidity', whereby, shortly before death, patients suffering from severe and sometimes incapacitating, psychiatric and neurological disorders, and who may be dull or unconscious, and have been so for years, exhibit an unexpected return of mental clarity and memory, with normal, or unusually enhanced, mental

abilities, including considerable elevation of mood and unaccustomed spiritual expression. In about half of cases this happens in the last 24 hours of life, and in almost 90% within a week of death.²⁵⁸ ‘It’s as if the damaged brain prevents the person from consciousness, but then as the brain finally begins to die, consciousness is released from the grasp of the degenerating brain.’²⁵⁹ Examples include case reports of patients suffering from brain abscesses, tumours, strokes, meningitis, dementia or Alzheimer’s disease, schizophrenia, and affective disorders.²⁶⁰ This is not a rare phenomenon, but is estimated to occur in 6–40% of cases.²⁶¹

Most compelling is the evidence of people who report complex ‘near death’ experiences at a time when the EEG shows brain activity to be absent.²⁶² People who are judged clinically dead and are resuscitated or revived after a brief interval with memories of what they have experienced, according to Bruce Greyson, who has studied the phenomenon,

typically report exceptional mental clarity, vivid sensory imagery, a clear memory of their experience, and an experience more real than their everyday life; all of this occurring under conditions of drastically altered brain function under which the materialist model would say that consciousness is impossible ... There’s a sense of the person’s thoughts being much faster and clearer than usual, and finally there was a life review or panoramic memory where their entire life seems to flash before them ... Typical emotions reported during the NDE [near death experience] include an overwhelming sense of peace and well-being, a sense of cosmic unity or being one with everything, a feeling of complete joy and a sense of being loved unconditionally ...

And he continues:

One of the things about NDE that interests me as a psychiatrist are the profound after-effects that people report, a consistent change in values that don’t fade over time. Near death experiencers report overwhelmingly that they’re ‘more spiritual’ after the experience, they have more compassion for others, and a greater desire to help others, a greater appreciation for life, and a stronger sense of

meaning or purpose in life ... An analysis of their medical records shows that mental functioning is significantly better in those people who come closest to death. Many NDErs experience a panoramic life review, not just visual images, but elaborate events, sometimes the entirety of that person's life.²⁶³

Such experiences are reported in many cultures, and have been commented on since at least the fifteenth century.²⁶⁴ In a British study, involving a five-year retrospective and a one-year prospective study, the majority (70%) of caregivers had witnessed 'end-of-life experiences' in their patients just before death;²⁶⁵ and the number may be greater, since previous unawareness of the phenomenon in staff and relatives alike may lead to under-reporting. These experiences differ from drug-induced hallucinations, and delirious states, and occur in clear consciousness.

Returning to Bergson, he saw memory, as well as consciousness, as being filtered by the brain:

it does not serve to preserve the past, but primarily to mask it, then to allow only what is practically useful to emerge through the mask. *Such, too, is the part the brain plays in regard to the mind generally.* Extracting from the mind what is externalisable in movement, inserting the mind into this motor frame, it causes it to limit its vision, but also it makes its action efficacious. This means that the mind overflows the brain on all sides, and that cerebral activity responds only to a very small part of mental activity.²⁶⁶

In view of the way in which the left hemisphere deliberately narrows focus ('to limit its vision'), and prioritises utility ('makes it action efficacious'), this seems, as so often with Bergson, to be an almost uncanny case of the mind intuiting brain function from careful introspection.

Similarly Schiller thought that the brain functioned so as to limit memory: 'this will serve to explain not only the extraordinary memories of the drowning and the dying generally, but also the curious hints which experimental psychology occasionally affords us that nothing is ever forgotten wholly and beyond recall.'²⁶⁷ As the stimulation by electrodes of brains exposed at surgery by Wilder Penfield illustrate, some kinds of

memories, at least, appear to be retained intact in the brain, yet under normal circumstances most are not available, for what Schiller, James and Bergson see as practical reasons.²⁶⁸ Occasionally brain injury may result in exceptional access to memory.²⁶⁹ Memories that are no longer accessible may nonetheless influence behaviour and can sometimes be accessed under hypnosis. That the brain needs to filter at least its own output in order to function properly is not controversial: less is often more.²⁷⁰

This idea that I have expressed as permission, or ‘filtering’, is remarkably consonant with Stapp’s explanation of the interaction of consciousness with Nature, whereby a set of potential outcomes is narrowed to one actual outcome. One way of putting this is that potentiality is collapsed into the actual through its interaction with consciousness, and that that is what we experience.²⁷¹

WHAT IS CONSCIOUSNESS OF?

Consciousness always has a correlate – what we are conscious *of*. What should we take the objects of consciousness to be? I suggest that they are just what they seem to be – not representations inside a closed mind of something unknowable outside it. On this, again, Strawson is admirably clear:

What is it to be a real realist about experience? One way to answer this is that it's to continue to take colour experience, say, or taste experience or pain experience to be exactly what one took it to be, quite unreflectively, before one did any philosophy ... However many new and astonishing facts real realists about experience learn from psychologists – facts about 'change blindness' or 'inattentional blindness' – their basic general understanding of what colour experience or pain experience is remains the same as it was before they did any philosophy. It remains, in other words, entirely correct, grounded in the fact that to have experience is already to know what it is, however little one reflects on it. To taste pineapple, in Locke's old example, is sufficient, as well as necessary, for knowing what it's like to taste pineapple ... I'm talking about the lived character of experience. With this in place, one can say the following. If, as a physicalist naturalist, you think that naturalism or physicalism gives you any good reason to give an account of experience that is in any way deflationary or reductionist relative to the ordinary pre-philosophical understanding of experience, then you have gone wrong.^{[272](#)}

This is not the same as saying that we cannot be deceived. The earth, we now know, is not flat. While experience is not negotiable, the interpretation of it is up for grabs. Imagination is involved. In the words of Lakoff and Johnson,

as embodied, imaginative creatures, *we never were separated or divorced from reality in the first place*. What has always made

science possible is our embodiment, not our transcendence of it, and our imagination, not our avoidance of it.²⁷³

According to geneticist Ho, there is

no mismatch between knowledge and our experience of reality. For reality is not a flat impenetrable surface of common-sensible literalness. It has breadths and depths beyond our wildest imagination. The quality of our vision depends entirely on the extent our consciousness permeates and resonates within her magical realm. In this respect, there is complete symmetry between science and art. Both are creative acts of the most intimate communion with reality.²⁷⁴

If one accepts that awareness is a fundamental element in whatever is, rather than a late emergent property from insensate matter, qualia (subjective qualities of experience) are not a ‘hard problem’ to solve, but the foundational nature of all existence.²⁷⁵ Calling himself a conscious realist, Donald Hoffman considers

conscious experiences as ontological primitives, the most basic ingredients of the world. I’m claiming that experiences are the real coin of the realm. The experiences of everyday life – my real feeling of a headache, my real taste of chocolate – that really is the ultimate nature of reality.²⁷⁶

This is because we cannot get behind experience to some fantasy of an objective (unexperienced) world, since experience is always involved in reality. But as I explained in the Introduction, this does not mean that there is no reality, just that we are part of its constitution.

This would also be Bergson’s position. ‘*There is a reality*’, he wrote, ‘*that is external and yet given immediately to the mind*. Common-sense is right on this point, as against the idealism and realism of the philosophers.’²⁷⁷ (Schelling, another touchstone for me on this path, was one of the first modern Western philosophers to transcend that dichotomy.)

It is what I think the Renaissance philosopher and polymath Pico della Mirandola was getting at when he said, referring to Sufism, that man is ‘the living union (as the Persians say), the very marriage hymn of the world’.^{[278](#)}

SO WHAT IS CONSCIOUSNESS FOR?

Built into the idea of the brain as permissive, or filtering, is, once again, the idea of resistance. Sculpting occurs through an impediment to the otherwise free flow of whatever it may be – in this case, of consciousness. In *The Master and his Emissary*, I touched on the philosophy of Heidegger's contemporary Max Scheler, whereby the experiential world is the product of two metaphysical forces or drives, which he called *Geist* and *Drang*. *Drang* is primary, and is a more elemental force, *Geist* a secondary, comparatively rarefied, intellectual force. 'While there is no simple equation between the right hemisphere and Scheler's *Drang* and the left hemisphere and his *Geist*', I wrote,

I believe this nonetheless illuminates an important element both in how the hemispheres relate to one another, and in how they together relate to whatever it is that exists apart from ourselves. The relationship between the hemispheres is *permissive* only. The right hemisphere can either fail to permit (by saying 'no') or permit (by not saying 'no'), aspects of Being to 'presence' to it. Until they do so, it does not know what they are, and so cannot be involved in their being as such prior to their disclosure. Subsequent to this, the left hemisphere can only fail to permit (by saying 'no'), or permit (by not saying 'no') aspects of what is 'presented' in the right hemisphere to be 're-presented': it does not know what the right hemisphere knows and therefore cannot be involved in its coming into being as such.^{[279](#)}

You will also remember that, in its genesis, the brain becomes more powerful by shedding neurones, and 'pruning' connexions; that a primary function of the corpus callosum is to inhibit, and probably the single most important function of the frontal lobes is to inhibit; and that the human brain has proportionately more inhibitory neurones than that of any other species.

Now let us go back to the philosophy of Schelling. His notion of *Weltseele* (world-soul) is of a primordial energy, not unlike Scheler's

Drang, though more all-encompassing. This stream of energy or world-soul flows in the cosmos, like a vital current, unimpeded until it encounters an asymmetry, an inequality, a difference within itself, which acts as a point of *resistance*. By this resistance something is precipitated out of the otherwise even flow, much as an eddy, a vortex, arises in a stream of water. This ‘product’ of Nature is nothing mechanical or inert: it flows with vital energy itself, constantly renewing itself through the flow, which is both the product’s cause and its effect. Individual human consciousnesses, according to Schelling, themselves arise from just such a vortex. Since everything that comes into being arises from a similar vortex within the flow, no one thing is absolutely distinct from anything else that exists, nor from the flow at large. But each has a special role, which is, arising out of the *Weltseele*, to achieve an expression of the *Weltseele*, such that it – the (always already) conscious ground of existence – can come to *know itself*. According to Schelling scholar Andrew Bowie, Schelling ‘endeavours to explain the emergence of the thinking subject from nature in terms of an “absolute I” coming retrospectively to know itself in a “history of self-consciousness” that forms the material of the system’.²⁸⁰ The consciousness of living beings is an expression of this primordial force through which it discovers the (potentially infinite) variety of which it is capable, and which it already is in essence. Such consciousness is the unpacking, the unfolding (literally, the ex-plication) of that force’s implicit order, without ever being a lifeless ‘product’ or mechanism, *natura naturata*: rather it is something in process and possessed of life of its own, *natura naturans*.

The physicist Henry Stapp underlines the way in which quantum theory lays the accent on potential, change and becoming – *events* – rather than actualisation, states and being – *things*.

The aspects of nature represented by the [quantum] theory are converted from elements of *being* to elements of *doing*. The effect of this change is profound: it replaces the world of *material substances* by a world populated by *actions*, and by *potentialities* for the occurrence of the various possible observed feedbacks from these actions. Thus this switch from ‘being to ‘action’ allows – and according to orthodox quantum theory demands – a draconian shift in the very subject matter of physical theory, from an imagined universe consisting of causally self-sufficient mindless matter, to a

universe populated by allowed possible physical actions and possible experienced feedbacks from such actions. A purported theory of matter alone is converted into a theory of the relationship between matter and mind.^{[281](#)}

The evolutionary biologist Julian Huxley saw something very similar to this. ‘Man’, he said, ‘is that part of reality in which and through which the cosmic process has become conscious and has begun to comprehend itself.’^{[282](#)} And Pierre Teilhard de Chardin, perhaps more strictly in Schelling’s spirit (though I am not aware that he read Schelling) wrote: ‘Man discovers that *he is nothing else than evolution become conscious of itself*.’^{[283](#)} Taking this forward again into the world of quantum physics, Bohm notes that ‘there is no need to regard the observer as basically separate from what he sees nor to reduce him to an epiphenomenon of the objective process. More broadly one could say that, through the human being, the universe has created a mirror to observe itself.’^{[284](#)} In Thomas Nagel’s words, ‘each of our lives is a part of the lengthy process of the universe gradually waking up and becoming aware of itself’.^{[285](#)}

In this light, the question ‘what is consciousness for?’ appears to be based on a false premise. Consciousness is nothing to our purpose; we are to the purpose of consciousness. We are part, more properly, of a purpose – that of self-knowledge – which lies fulfilled within itself, not requiring buttressing from without by any justification in terms of utility.

Philosophy faces its most fundamental challenges at the interface between consciousness and matter: all the great questions are there. Why is there something rather than nothing? Why is that ‘something’ complex, beautiful and orderly, rather than meaningless, ugly and chaotic? Why is it perfectly, exquisitely, calibrated so as to make the existence of matter possible? And life, and sentient beings, possible? And how is it that we are equipped to understand its complexity, beauty and order? As physicist David Deutsch puts it, ‘The extraordinary thing is not that there are laws but that we can understand them. Why should we be able to understand them? It’s almost as if, whenever we land on a new and unknown planet the inhabitants come up and speak to us in English. Why should the laws of the universe be understandable by us? Well, either it’s a fantastic coincidence or there’s some deep reason why it had to be that way.’^{[286](#)}

‘Physicalism’, writes Whitehead scholar Matt Segall, referring to what I call scientific materialism,

is the idea that the universe is fundamentally composed of entirely blind, deaf, dumb – DEAD – particles in purposeless motion through empty space. For some reason, these dumb particles follow the orders of a system of eternal mathematical laws that, for some reason, the human mind, itself made of nothing more than dumb particles, is capable of comprehending. On this definition of physicalism, ‘life’ and ‘consciousness’ are just words we have for epiphenomenal illusions with no causal influence on what happens. ‘Life’ is a genetic algorithm and ‘consciousness’ is a meme machine, in Dawkins’ and Dennett’s terms. We are undead zombies, not living persons, on this reading of physicalism.²⁸⁷

By contrast, according to Thomas Nagel, ‘the inescapable fact that has to be accommodated in any complete conception of the universe’,

is that the appearance of living organisms has eventually given rise to consciousness, perception, desire, action, and the formation of both beliefs and intentions on the basis of reasons. If all this has a natural explanation, the possibilities were inherent in the universe long before there was life, and inherent in early life long before the appearance of animals. A satisfying explanation would show that the realisation of these possibilities was not vanishingly improbable but a significant likelihood given the laws of nature and the composition of the universe. It would reveal mind and reason as basic aspects of a nonmaterialistic natural order.²⁸⁸

If one is certain that consciousness emerged from matter, then this is indeed a conundrum, and I agree with Nagel’s conclusions. But to me even for the *possibilities* of consciousness, and all the rest, to be inherent, the actualities must have been present, otherwise we are back to what one might call the Midshipman Easy problem. Nagel points up the trap for reductionism, since, if consciousness exists (and it does) and it cannot emerge (and it cannot), this implies that consciousness was there all along.

So he continues: ‘since conscious organisms are not composed of a special kind of stuff, but can be constructed, apparently, from any of the matter in the universe, suitably arranged, it follows that this monism will be universal. Everything, living or not, is constituted from elements having a nature that is both physical and nonphysical – that is, capable of combining into mental wholes.’^{[289](#)}

OPEN AND CLOSED SYSTEMS

Here I would make a reflection on the relationship between consciousness and life. ‘Thought and matter have a great similarity of order’, says Bohm, ‘in a way, nature is alive, as Whitehead would say, all the way to the depths. And intelligent. Thus it is both mental and material, as we are.’²⁹⁰

I have quoted from Schrödinger’s *What Is Life?* before. It is often read as reassuringly decomplexifying life, by approximating it to physics; but as the biophysicist, mathematician and systems theorist Robert Rosen realised, what many readers have not noticed is that what Schrödinger was actually doing was complexifying physics, by approximating it to life. In Rosen’s words, though Schrödinger was one of the outstanding theoretical physicists of all time,

one of the striking features of his essay is the constantly iterated apologies he makes, both for his physics and for himself personally. While repeatedly proclaiming the ‘universality’ of contemporary physics, he equally repeatedly points out (quite rightly) the utter failure of its laws to say anything significant about the biosphere and what is in it. What he was trying to say was stated a little later, perhaps even more vividly, by Albert Einstein. In a letter to Leo Szilard, Einstein said, ‘One can best feel in dealing with living things *how primitive physics still is*’.²⁹¹ Schrödinger and Einstein were not just being modest; they were pointing to a conundrum about contemporary physics itself, and about its relation to life.²⁹²

What Rosen suggests is that Schrödinger, for the first time, had realised, not just that the study of matter might teach us about organisms, but that ‘organisms teach new lessons about matter in general’.²⁹³ All living things involve open systems. An open system is not just a closed system with a little bit added on, but a wholly different kind of system, nothing like the artificially isolated, predictable, closed systems, at or near equilibrium, assumed by classical physics. What Schrödinger saw was that life was not a marginal phenomenon within classical physics, but rather classical physics, with its ‘assumption of excessively restrictive closure conditions’,

conservation laws and similar highly atypical features, was a special, limiting case of the physics of open systems such as, but by no means confined to, life. Such irreducibly complex systems have the capacity to generate and maintain stable patterns that, though partially constrained, are neither rigid nor wholly predictable, and thus never wholly capable of being objectified or computed. And they are everywhere in the universe – in stars and galaxies, as well as in what we normally call life. David Oliver sees something very like this dynamism, and the capacity for self-organisation, in the realm of the inorganic:

Life is the outstanding example of dynamism, but not all dynamism is life. Beyond life, the geological structures of the planet send and receive seismic signals which in turn induce tectonic motion. Before life, the physics and chemistry of organic and amino acids and amphiphilic compounds were sufficiently evolved to self-assemble bilayers separating one set of chemicals from another – an important pre-cursor to the cell. Inorganic nature is rich in self-organization in which simple atoms and molecules interact through their force fields to create complex abiotic chemical cycles and structures: dynamism outside of life, much of which is a prelude to life. ²⁹⁴

When it comes to approaching complex systems, one cannot seek an understanding only by going downwards to subsystems, by analysis. This is where reductionism is impotent. When it comes to open systems, in order to understand what is going on ‘inside’ the system, we need to look equally upwards and outwards to the system’s environment. A system cannot be fully known if its subsystems are not known; yet knowing a subsystem requires knowledge of the larger system to which it belongs. There is a recursive loop here.

Reductionist science, Rosen claims, is based on three ideas, each of which is easily challenged. The first is that simplicity is generic, and complexity rare. The second is that these simple, generic systems are independent of context. And, third, that you get from simple to complex along a continuous gradient by merely adding simple, context-free systems together. This last leads to the assumption that ‘the analysis of more complex systems is merely a matter of inverting the accretions that produced them.’ Collectively, he continues, these assumptions

serve to make biology unreachable from contemporary physics, which is based on them. At the same time, qualifying any of them would profoundly modify the conceptual basis of contemporary physics itself. This is why the phenomena of biology embody a foundations-crisis for contemporary physics, far more profound than any that physics has yet seen. Indeed it is more accurate to invert the presumptions. Namely, there is a sense in which complex systems are far more generic than simple, context-independent ones. Moreover, analysis and synthesis are not simple rote operations, nor are they in any sense inverses of one another. In short, the entire identification of *context-independence* with *objectivity* is itself far too special and cannot be retained in its present form as a foundation for physics itself.²⁹⁵

What Rosen suggests is that such a model is not only not generic, but is ‘far too restricted and specialised to accommodate things like organisms’:

Biology is not simply a special case, a rare and overly complicated anomaly, a non-generic excrescence in the world of objective things. To the contrary, it is that world itself that is non-generic, and it is organisms which are too general to fit into it. This too counts as an objective fact, and it is one with which (contemporary) physics *must* come to terms, if it indeed seeks to comprehend all of material nature within its precincts.²⁹⁶

The question ‘How does life emerge from inanimacy?’ is, like ‘How does consciousness emerge from matter?’, a question based on premisses that are themselves questionable. As matter is a special case of consciousness, inanimacy should be seen, according to Rosen, as a special, indeed the limiting, case of life. CS Peirce would have agreed: acknowledging his debt to Schelling, he also held that matter was ‘mere specialized and partially deadened mind’.²⁹⁷ Our idea of life comes from every living species, not just the most primitive ones, *each* telling us something about the nature of life. As Whitehead asks, ‘why construe the later forms by analogy to the earlier forms. Why not reverse the process?’²⁹⁸ Higher, biological, forms of organisation of matter tell us

about simpler ones, as much as simpler ones are supposed to tell us about what life is – and *more*.²⁹⁹ The structure of the universe is, according to Bohm, ‘much more reminiscent of how the organs constituting living beings are related, than it is of how parts of a machine interact.’³⁰⁰

‘Science is taking on a new aspect which is neither purely physical, nor purely biological’, Whitehead says elsewhere. ‘It is becoming the study of organisms. Biology is the study of the larger organisms; whereas physics is the study of the smaller organisms.’³⁰¹ The rigid partition between organic and inorganic breaks down; and when it does so one consequence is that, since the more complex can’t be constructed out of the less complex by mere summation of simple components, but the less complex *can* be constrained out of the more complex by setting enough limiting conditions, it is at least as logical, if not more so, to see the inanimate as a limit case of the animate, as to see life as a peculiar subset of inanimacy. Here is Rosen again:

organisms, far from being a special case, an embodiment of more general principles or laws we believe we already know, are indications that these laws themselves are profoundly incomplete. The universe described by these laws is an extremely impoverished, non-generic one, and one in which life cannot exist. In short, far from being a special case of these laws, and reducible to them, biology provides the most spectacular examples of their inadequacy. The alternative is not vitalism, but rather a more generic view of the scientific world itself, in which it is the mechanistic laws that are the special cases.³⁰²

In other words, organicism, like consciousness, may be a foundational principle of the cosmos: the mechanisms we wish to base our understanding on may be no more than simplified mental abstractions from the whole. Note that this is not vitalism, which requires the addition of an extraneous element to matter, but its precise opposite: nothing needs adding to matter, since matter is nothing like what it is projected to be – namely, simple, inert until set in motion, and separate from consciousness. Schelling had already pointed out that the problem is to account not for motion in Nature, but for

whatever is resting, or permanent; since permanence ‘is a limitation of its own activity’: stasis is the limit case of life.³⁰³

Because this may be a step too far for some minds priding themselves on their rationalism – there is of course nothing irrational about what Rosen is suggesting, just unusual by the standards of present day scientific assumptions – I’d point out that the great Enlightenment *philosophe* Diderot, writing in 1769, had this to say:

All is in perpetual flux ... every animal has something of the human; every mineral has something of the plant; every plant has something of the animal. There is nothing circumscribed in nature ... Each form has its own proper fortune or misfortune. From the elephant to the flea ... from the flea to the sensitive and living molecule, the origin of everything, there is not a point anywhere in the whole of nature that does not suffer or take delight.³⁰⁴

A NEW WAY OF SEEING THINGS

So much, for now, of life. Let us return to consciousness, and see what happens if we set aside for a moment the idea that it arises from matter in a random universe (none of which seems very likely in any case, for reasons some of which I have touched on), and instead think along the lines that I have indicated. I am not claiming to prove anything at all – in this area the very idea of proof is inappropriate; and I cannot expect to convince the reluctant. I want merely to offer an alternative *Gestalt* or world-picture that, to me at least, accommodates some of these questions better than other world-pictures I have explored. The reader must decide for himself or herself whether it resonates with experience and intuition better or worse than reductionist materialism.

If matter is a product of primal consciousness, and is the creative element of resistance within it which causes ‘things’ – becomings and processes – to be precipitated out as differentiated entities in space and time, this requires no further purpose than itself. It is the never-ending coming into being of the cosmos, in which the primal consciousness comes to understand itself, and even fulfil itself, through the realisation of what would otherwise remain unknowable potential, in a constant act of creation. There is no sundering between the ‘positive’ processive part of the whole and the ‘negative’ resistant part of the whole; they are not a duality, but complementary and mutually necessary aspects of the same entity, just as the vortex is caused *by* the flow, from an element *in* the flow which partly *impedes* the flow – and *is* the flow for that time and that place. To use the time-honoured Chinese formulation, it is thus that the One and the 10,000 Things can be seen to be one.

If there is anything in this idea, it helps us approach the thorny questions differently. That is all – it is not designed to compel consent, which in these matters cannot in any case be compelled (if it could, philosophy would have come to an end a long time ago). But if the material cosmos is an emanation or projection of a grounding consciousness it will as a matter of course have the necessary, apparently fine-tuned, conditions to come into existence; it will naturally have the qualities of order, beauty and complexity because it issues from a consciousness that, like us, is

attuned to and gives rise to such elements; it will naturally produce conscious beings, and the conscious beings will naturally be able to speak its language, since they are generated by it. Of course this does not answer the unanswerable question, why there is something rather than nothing. It can do no more than postulate that the grounding consciousness is intrinsically creative and that part of its self-realisation is the realisation of the cosmos: something, not nothing.

Of course this is to make assumptions, but it is impossible not to make assumptions. The standard materialist position makes assumptions of its own, eg, that all is entirely random and meaningless; that nothing exists apart from matter; or that if consciousness exists, it comes about secondarily at some point in evolution out of something fundamentally alien to consciousness; that the order and beauty and ‘apparently’ purposive drive in things cannot be explained, as neither can our capacity to appreciate and understand more than a very small part of them (see Chapter 26), and that these are all remarkable coincidences (whenever we land on a new and unknown planet the inhabitants come up and speak to us in English). On either my outline or this one, order still emerges out of chaos and things naturally complexify without outside intervention; the difference is that in the materialist paradigm all that is inexplicable. So is the fine-tuning of the cosmos. Attempts to explain it result in the extravagant postulate that there are an infinite number of universes, so that eventually one like this is bound to come about by chance. Occam wept.

As an alternative to the view that teleology is of the stuff of the universe, as Nagel points out, there is the view that

this universe is not unique, but that all possible universes exist, and we find ourselves, not surprisingly, in one that contains life. But that is a cop-out, which dispenses with the attempt to explain anything ... One doesn’t show that something doesn’t require explanation by pointing out that it is a condition of one’s existence. If I ask for an explanation of the fact that the air pressure in the transcontinental jet is close to that at sea level, it is no answer to point out that if it weren’t, I’d be dead.³⁰⁵

And it does not address the question why life and its necessary conditions *exist at all*.

The grounding consciousness is not deterministic. It has none of the characteristics of an omnipotent and omniscient engineering God constructing and winding up a mechanism. It is in the process of discovering itself through its creative potential (one thing we all know directly from our own experience is that consciousness is endlessly creative). According to philosopher Arran Gare,

life is self-organizing and has to be appreciated as such. Schelling rejected both appeals to a creator of Nature and to a life-force to account for life. ‘You *destroy* all idea of *Nature* from the very bottom, as soon as you allow the purposiveness to enter her from without, through a transfer from the intelligence of any being whatever.’³⁰⁶ ‘Life-force’, Schelling went on, ‘is a completely self-contradictory concept.’³⁰⁷

It may sound as if his *Weltseele*, the energetic creative force, is just such a life force. But it is not. What Schelling is fending off is the notion that Nature, or the ground of being, needs a life force adding in, extrinsically, so to speak, to make what happens happen, the effect of which addition would be actually to rob Nature of its *intrinsic* creative potential. This also applies, as he says, to ‘purposiveness’, and it is perhaps easier to see the problem there.

Many discussions about whether life or the cosmos more generally display purpose founder on an important distinction between two meanings of purpose that are at loggerheads with one another. This can be seen most easily by speaking about works of art or people. If a piece of music is thought of as having an extrinsic purpose, such as to help you relax, it is misunderstood and diminished. If mindfulness is thought of as a way to make bankers more efficient at generating profits, it is misconceived and degraded. If a person is thought of as having a purpose, he becomes a mere tool. But this doesn’t exclude a different meaning of purpose. Each of these – the music, the spiritual practice, the person – has a kind of purpose which is fulfilled by its mere being itself (this is not simply to say that they are valued: see Chapter 27). Importing the extrinsic kind of purpose immediately destroys the intrinsic kind of purpose. A watchmaker, omniscient and omnipotent engineering God imports extrinsic purpose and

is an idea of this destructive kind. So would be a 'life force' that was brought in: it would deny the vitality of the cosmos *per se*.

This puts me in mind again of Nagel, speaking of theistic conceptions:

To make the possibility of conscious life a consequence of the natural order created by God while ascribing its actuality to subsequent divine intervention would then seem an arbitrary complication.³⁰⁸

The *Gestalt* I offer has a number of other things going for it, I believe. It chimes with, and I believe makes best sense of, Eddington's view that 'we have found a strange foot-print on the shores of the unknown ... we have succeeded in reconstructing the creature that made the footprint. And Lo! it is our own.' At the same time it removes some of the unintended implications of solipsism that are troubling in that formulation. In fact it importantly suggests how and why the realism/idealism divide and the objective/subjective divide can be, and are, transcended. The key point is that the ground of consciousness has given rise to something other than itself wholly out of itself, that is *nonetheless not wholly determined by the ground of consciousness*. There is an element that cannot in the nature of things be predicted: there is room for freedom. After only eight collisions of the billiard balls, we are already in – not accidentally, but *essentially* – unpredictable territory. The process of discovery that this makes possible depends on there being distinctness but not complete separation: the unity of difference with union.

I think it also gives us a new potential take on the so-called binding problem: how the various modules of brain function result in a single sense of one experiencing self. If consciousness does not have to be 'put together' from modules in such a way as to result in a unified consciousness, but is instead permitted or moulded as a whole by the brain, the famously unsolved binding problem does not arise. Just a tiny example, but some nice research on infant development by Elizabeth Spelke suggests this may be right. Piaget had contended that in babies the five senses operated separately, and that 'intermodal perception' – the capacity to recognise, for instance, that the clattering sound you just heard and the pot lid you just saw your mother drop are part of the same event – developed later, during toddlerhood. In other words, a 'put-together-the-modules' theory. Spelke

was sceptical of the Piaget line; in the mid 1970s, she devised an experiment to test it. She showed four-month-old infants two films, on side-by-side screens, while playing the soundtrack for just one of them. Babies focussed on the screen for which the soundtrack was appropriate, correctly matching the picture and sound.³⁰⁹ To quote Giulio Tononi and Christof Koch, ‘consciousness is unified: each experience is irreducible to non-interdependent subsets of phenomenal distinctions’.³¹⁰

This is quite compatible with hemisphere differences, as Koch demonstrates when he says, ‘because both the speaking *and* the mute hemispheres carry out complex, planned behaviours, both hemispheres will have conscious percepts, even though the character and content of their feelings may not be the same’.³¹¹ It is not that consciousness is fragmentary and must be integrated if there are to be individual beings; it’s that consciousness is integral and must somehow be divided if there are to be individual beings. The whole business of consciousness limiting itself by embracing the stickiness of matter (remember, matter slows energy down and makes its forms persist longer than they otherwise would), is to produce differentiation, individuation, thisness, actuality precipitated out of a sea of potential. The process of individuation involves sculpting, filtering – however one wants to put it, delimiting and distinguishing – parts of the seamless whole. Thus the brain needs two streams of consciousness, one in each hemisphere, but they are like two branches of a stream that divide round an island and then reunite.

A stumbling block for the scientific reception of any such a model is that science is not well disposed towards what cannot be localised, sensed nor measured, such as is mind (contemporary physicists may be, perforce, an exception). Nonetheless mind remains embarrassingly real. Nobel Prize-winning physiologist George Wald thought that ‘the stuff of which physical reality is composed is mind-stuff. It is Mind that has composed a physical universe that breeds life, and so eventually evolves creatures that know and create ... In them the universe begins to know itself.’³¹² This is entirely in keeping with the model I am recommending for consideration. But, echoing Yukawa’s words, Wald reflected: ‘Let me say that it is not only easier to say these things to physicists than to my fellow biologists, but easier to say them in India than in the West’.³¹³ He continues: ‘Mind is not only not locatable, *it has no location*. It is not a thing in space and time, not

measurable; hence – as I said at the beginning of this paper – not assimilable as science.’ He put forward the hypothesis that

Mind, rather than being a very late development in the evolution of living things, restricted to organisms with the most complex nervous systems – all of which I had believed to be true – that Mind instead has been there always, and that this universe is life-breeding because the pervasive presence of Mind had guided it to be so. That thought, though elating as a game is elating, so offended my scientific possibilities as to embarrass me. It took only a few weeks, however, for me to realize that I was in excellent company. That kind of thought is not only deeply embedded in millennia-old Eastern philosophies, but it has been expressed plainly by a number of great and very recent physicists. [314](#)

IS CONSCIOUSNESS WHOLLY PERSONAL?

What is the relationship between consciousness as a whole and the individual consciousness?

The twelfth-century Muslim philosopher Averroes believed that only one intellect exists for the whole human race, in which every individual participates to the exclusion of personal immortality. 'A human being is a part, limited in time and space, of the whole that we call the Universe', wrote Einstein. 'He experiences himself and his feelings as cut off from the rest – an optical illusion of his consciousness.'³¹⁵ Other physicists have embraced similar notions. Bohm proposed human participation in 'a greater collective Mind in principle capable of going indefinitely beyond even the human species as a whole.'³¹⁶ Such a collective mind parallels the collective unconscious posited by Jung, and which for him made sense of the existence of archetypes that seem given, rather than acquired, in the human psyche. In most cultures there is a belief in consciousness that transcends the locality of the body in space and time. Schrödinger put it like this: 'consciousness is a singular of which the plural is unknown.'³¹⁷

The year before he died, James wrote:

Out of my experience, such as it is (and it is limited enough) one fixed conclusion dogmatically emerges, and that is this, that we with our lives are like islands in the sea, or like trees in the forest. The maple and the pine may whisper to each other with their leaves ... But the trees also commingle their roots in the darkness underground, and the islands also hang together through the ocean's bottom. Just so there is a continuum of cosmic consciousness, against which our individuality builds but accidental fences, and into which our several minds plunge as into a mother-sea or reservoir.³¹⁸

And in *A Pluralistic Universe*, published in the same year: 'Mental facts do function both singly and together, at once, and we finite minds may simultaneously be co-conscious with one another in a superhuman intelligence.'³¹⁹ What we consciously experience as individuals is, for

James, selected by our brains from a much larger field of consciousness. This would also be compatible with Scheler's view that when we share thoughts and feelings, this does not describe the linking of two locations, one in my head and one in yours, but a literal sharing, outside of any such spatial considerations. Perhaps we should say not that thoughts and feelings are in us, but we in them.

'Sentience was never our private possession', writes David Abram. 'We live immersed in intelligence, enveloped and informed by a creativity we cannot fathom':

The world we inhabit ... is a sensitive sphere suspended in the solar wind, a round field of sentience sustained by the relationships between the myriad lives and sensibilities that compose it. We come to know more of this sphere not by detaching ourselves from our felt experience, but by inhabiting our bodily experience all the more richly and wakefully, feeling our way into deeper contact with other experiencing bodies, and hence with the wild, inter-corporeal life of the earth itself. ³²⁰

Suppose that I am right and that everything is ultimately part of one consciousness, that individual consciousnesses are never wholly separate from the whole – much as vortices in the stream, or waves in the sea, are visible, measurable and truly distinguishable, but not separate, from the body of water in which they arise – then the individual correctly perceives a self, but a self that is connected to the whole: wholly a self, and wholly part of the whole. To see the eddy as a separate entity from the river, or the wave as something 'additional to' the sea, causes the self to become unstable: either wholly localisable or lost in the whole, not part and whole together. A better image perhaps of the proposed relation of the individual consciousness to the whole is that of a cell membrane that has protrusions or 'evolutions' in it. Inside any such villous protrusion, one would seem to be completely bounded by membrane on all sides – except right at the foot of it, where the interior of the villus is seen to be seamlessly merged with the cytoplasm of the cell as a whole.

Our consciousness goes out to meet other consciousnesses, where it can merge without loss, but rather with enrichment, of self. Heidegger captured this when he wrote to Hannah Arendt of the 'sweet burden' of love, that

‘we become what we love and yet remain ourselves.’³²¹ More stringently, Schrödinger conveyed it as the impossibility of seeing the whole at once from any one viewpoint: ‘This life of yours which you are living is not merely a piece of the entire existence, but is in a certain sense the *whole*; only this whole is not so constituted that it can be surveyed in one single glance.’³²² Ryōan-ji again.

I believe that what exists is a locally differentiated, but ultimately single, field of potentiality, which is constantly actualising itself. Thus all is one, and all is many. Each differentiation is, however, also a *Gestalt* that is complete in itself – a new whole, not a fragment. This seems to me the essence of creation – differentiation of something that is not thereby destroyed in its unity, but enriched, as with the unfolding of something hitherto implicit into a new more explicit order. So what we see as distinct is distinct, but it does not have to be effortfully ‘connected’ to anything else, because it is never wholly separate. Here I find Wordsworth’s formulation, ‘in Nature everything is distinct, yet no thing defined into absolute, independent singleness’, simple, beautiful and true.³²³ I see matter as a special case, or ‘phase’, of consciousness, which is the primal ‘stuff’ out of which the universe is made.

IMPLICATIONS OF THE HEMISPHERE HYPOTHESIS

What if any are the implications of the hemisphere hypothesis here? And how legitimate is it to make comparisons between hemisphere differences and the findings of physics?

Types of attention to matter matter

First of all, if our experience is mediated for us by a brain that pays attention to the world in two broadly different ways, the world will, as I have tried to show throughout this book, have apparently paradoxical qualities, sometimes conforming to the qualities revealed by one and sometimes to the qualities revealed by the other. We have seen how this applies in the realm of the everyday, but it applies just as much in the realm of the very small or large. In fact it is particularly evident that it must apply to the interaction of attention with physical systems at the quantum level, since the role of attention there is explicit in a way that in the everyday setting is conventionally glossed over – though it is just as real there. Quantum theory focusses our attention on the role of attention.

Second, we have already seen that Pauli raised the question whether there were phenomena ‘that depend on *who* observes them (ie, on the nature of the psyche of the observer)’. It is not incoherent to believe that qualitative differences – which it may be assumed have at least something to do with the quality of attention – may affect what is observed to happen. And a main source of difference in the quality of attention is which hemisphere is primarily engaged in attending. As Bohm explains, in doing so seeming to refer to hemisphere differences in attention:

Man’s general way of thinking of the totality, ie his general world view, is crucial for overall order of the human mind itself. If he thinks of the totality as constituted of independent fragments, then that is how his mind will tend to operate, but if he can include everything coherently and harmoniously in an overall whole that is undivided, unbroken and without a border (for every border is a

division or break) then his mind will tend to move in a similar way, and from this will flow an orderly action within the whole.³²⁴

And he continued, more explicitly referencing hemisphere differences, and their relationship to the thriving of a culture:

My suggestion is that at each stage the proper order of operation of the mind requires an overall grasp of what is generally known, not only in formal, logical, mathematical terms, but also intuitively, in images, feelings, poetic usage of language, etc. (Perhaps we could say that this is what is involved in harmony between the “left brain” and the “right brain”). This kind of overall way of thinking is not only a fertile source of new theoretical ideas: it is needed for the human mind to function in a generally harmonious way, which could in turn help to make possible an orderly and stable society ... however, this requires a continual flow and development of our general notions of reality.³²⁵

This leads naturally to the question of the legitimacy of drawing parallels between psychology and physics. There is a consensus among many physicists that what they are talking about must be applicable outside of the narrow confines of physics. According to Heisenberg, one of Bohr’s oft-repeated ‘quotations’ was ‘clarity is gained through breadth’.³²⁶ (If it is indeed a quotation, he may have been thinking of Heraclitus’ dictum: ‘men who love wisdom must be good enquirers into many things indeed’; or of Plotinus: ‘all things are full of signs, and it is a wise man who can learn about one thing from another’.)³²⁷ Such breadth is itself the forte of the right hemisphere. Pauli wrote that ‘this business of complementarity within physics leads naturally beyond the narrower field of physics to analogous situations to be found in the usual conditions of human knowledge ... Indeed the relationship between subject and object has paradoxical qualities, which form a far-reaching analogy to the relationship between the means of observation and the system being observed, as we encounter it in quantum physics.’³²⁸

Bohr thought that ‘the necessity of considering the interaction between the measuring instruments and the object under investigation in atomic

mechanics corresponds closely to the peculiar difficulties, met with in psychological analyses, which arise from the fact that the mental content is invariably altered *when the attention is concentrated on any single feature of it.*' He contended that this analogy 'offers an essential clarification of the psycho-physical parallelism.' ³²⁹ Elsewhere he compared the contrast between wave and particle to the contrast between the 'continuous onward flow of associative thinking and the preservation of the unity of the personality'. This, he thought,

exhibits a suggestive analogy with the relation between the wave description of the motions of material particles ... and their indestructible individuality. The unavoidable influence on atomic phenomena caused by observing them here corresponds to the well-known change of the tinge of the psychological experiences which accompanies any direction of the attention to one of their various elements. ³³⁰

Planck wrote that

Natural science and the intellectual sciences cannot be rigorously separated. They form a single interconnected system and if they are touched at any part the effects are felt through all the ramifications of the whole, the totality of which is forthwith set in motion ... It would be absurd to assume that a fixed and certain law is predominant in physics unless the same were true also in biology and psychology ... the nature of any system cannot be discovered by dividing it into its component parts and studying each part by itself, since such a method often implies the loss of important properties of the system. We must keep our attention fixed on the whole and on the interconnection between the parts. ³³¹

Note that both Bohr and Planck pass from the analogy between the psychological and the physical to aspects of the psychological world that mirror established hemisphere differences. Thus Bohr refers to capacity for flow and interpenetration on the one hand and distinctness on the other. Planck refers to seeing the whole and seeing the parts. Something similar is

seen in Heisenberg, who drew a parallel between complementarity in physics and different modes of attention to music. 'We realise that the situation of complementarity is not confined to the atomic world alone; we meet it ... when we have the choice between enjoying music and analysing its structure.'³³²

From 1932 until his death in 1958, Pauli collaborated with Jung in conceptualising the unconscious mind as the psychological analogy of the field concept in quantum physics. An interesting thought arises, namely that it is specific focussed attention to quantifying detail that causes collapse of the wave function, or, put differently, causes the field to become quantised. Such attention is characteristic of the brain's left hemisphere, which requires the 'either/or' aspect of experience to stand forward: what is ambivalent becomes univalent, what was flowing becomes fixed, what was diffusely connected to and embedded in the context becomes arbitrary. The right hemisphere could be seen as the field of potential in which things remain fluid, non-localised, implicit and interconnected. To the extent that the right hemisphere is more identified with the unconscious mind and the left hemisphere with the self-reflexively aware mind, this corroborates Pauli's insight into Jung.

Asymmetry of continuity and discontinuity

Jeans, too, hinted at the way in which complementarity must exist at the mental level, noting that, since the observation that the electron did not obey the particle model, 'there had been a progress towards the truth', in which

each step was from particle to waves, or from the material to the mental; the final picture consists wholly of waves, and its ingredients are wholly mental constructs ... the cumulative evidence of various pieces of probable reasoning makes it seem more and more likely that reality is better described as mental than as material ... There is no longer a dualism of mind and matter, but of waves and particles ... The two members of this dualism are no longer antagonistic or mutually exclusive; rather they are complementary. We need no longer devise elaborate mechanisms, as Descartes and

Leibniz did, to keep the two in step, for one controls the other – the waves control the particles, or in the old terminology the mental controls the material.³³³

If reality is mental, as so many physicists repeatedly stress, and has two primary modes with mutually impossible but nonetheless complementary features, both of which are needed, this constitutes a remarkable parallel between the complementarity of the physicists and the complementarity of the two modes of attention that, I believe, underwrite our paradoxical mental life. Jeans here also corroborates the idea that, within the complementarity, one of the parties is ontologically prior to the other: mind to matter, wave to particle.

That makes sense to me, because while a particle symbolises discreteness, a wave symbolises both discreteness and union. There is one aspect of a wave that I have not touched on so far: the possibility of a standing wave. A standing wave is one which persists, by maintaining harmonised oscillations that do not cancel one another out: this requires a whole number of oscillations. Think of a string, such as that of a musical instrument, that is fixed at either end. When it is plucked, it must make a whole number of troughs and peaks: it can make 1, 2, 3, 4 etc, but not, for example, $1\frac{1}{2}$, or $2\frac{1}{4}$ peaks:

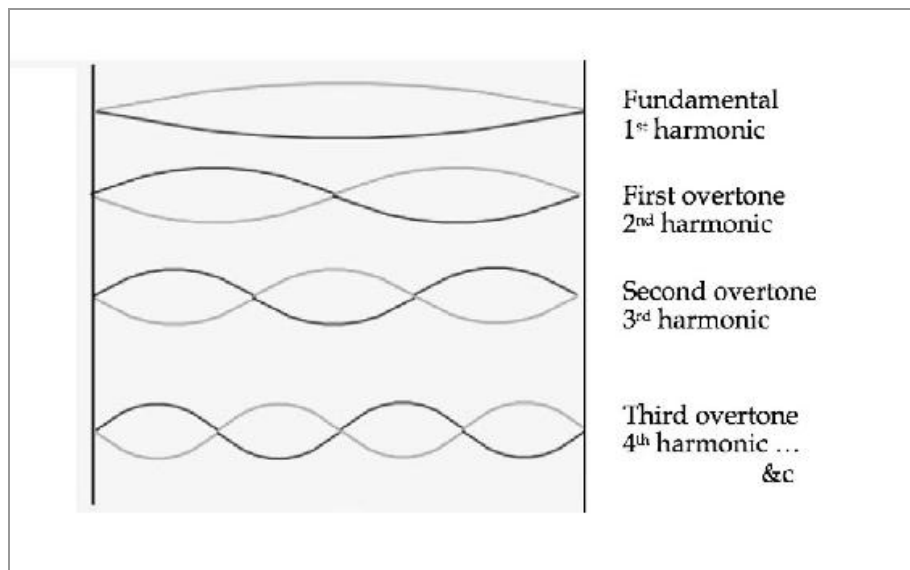


Fig. 58. Harmonic oscillations

If one thinks of electronic orbits as waves that are standing, they can do so only if the number of oscillations is, similarly, a whole number, otherwise at the point where the wave completed a circuit it would not coincide with its origin:

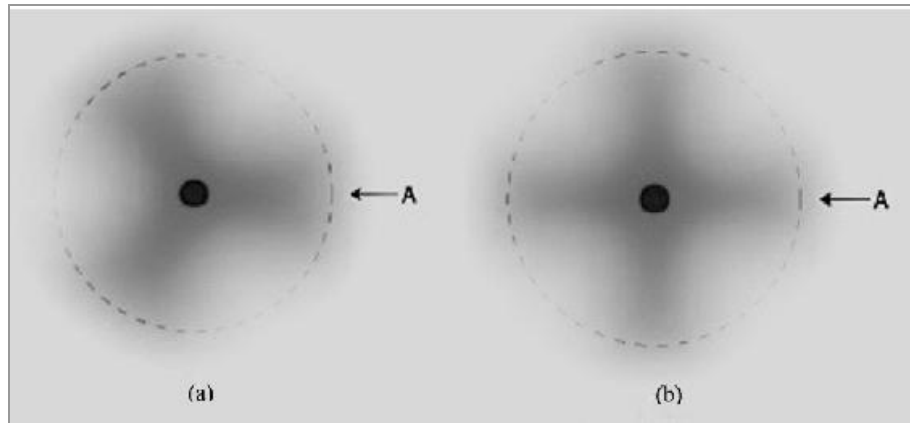


Fig. 59. How continuous oscillations lead to discrete levels of energy. Each diagram is a 'snapshot' taken at a single instant. This is not intended to be a realistic picture of a hydrogen atom: it is designed only to show how the field picture, with its oscillations, leads to discrete levels of energy. (Adapted from colour version in Brooks 2016 [location 1888])

Fig. 59 shows simplified patterns of oscillation of the electron field in a hydrogen atom. The dashed circle shows the electron's path as a waveform, circling the nucleus: bolder dashes and shading represent peaks, while fainter dashes and shading represent troughs. In (a) there are three peaks of the wave, corresponding to three zones of field intensity; in (b), with a higher frequency of oscillation, there are four peaks. These patterns change with time as the fields oscillate. As the wave, or field intensity, 'travels' round the nucleus, it must meet its starting point (A) on its return. This becomes obvious if one thinks again of the oscillations of a string (see Fig. 60):

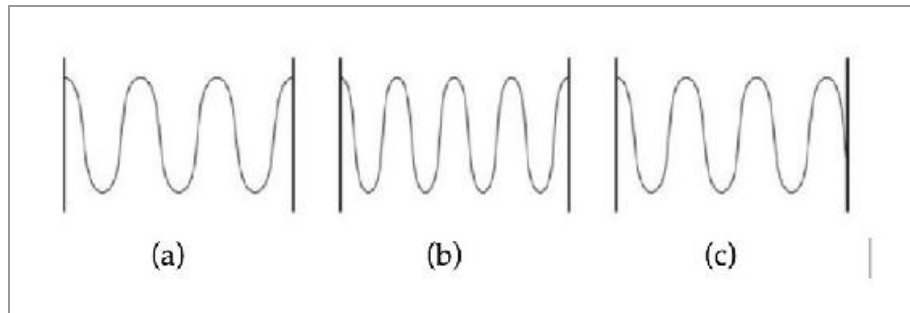


Fig. 60. Oscillations in a string: (a) and (b) are possible, while (c) is not (adapted from Brooks 2016)

In (a) three cycles, and in (b) four cycles, are possible: in (c) it is clear that $3\frac{1}{4}$ cycles are not.

‘This was de Broglie’s great insight’, writes Brooks: ‘if the electron in an atom is made of waves then the number of waves must be an integer, and the corresponding frequencies must be discrete. And since the frequency of oscillation is related to the energy of the electron field, the energy states must be discrete.’³³⁴ What this implies is that the waveform, while wholly continuous, incorporates necessary discreteness – *seamlessly*. This is beautiful.

And de Broglie has this to say:

In physics, as in every other branch of knowledge, the problem of continuity and discontinuity has existed at all times: for in this science, as elsewhere, the human mind has always manifested two tendencies at once antagonistic and complementary. On the one hand, there is the tendency which tries to reduce the complexity of phenomena to the existence of simple elements indivisible, and capable of being counted; a tendency whose analysis of Reality seeks to reduce it to a dust-cloud of individuals. On the other hand, there is the tendency, based on our intuitive notion of Time and Space, which observes the universal interaction of things and regards every attempt to disengage definite individual entities from the flux of natural phenomena as artificial ...

This is an uncannily accurate description of the most quintessential hemisphere differences. And he goes on:

What gives a special interest to the question of the continuous and the discontinuous in modern Physics is the fact that, during the last few years, it has arisen in a particularly clear-cut and also novel form. More definitely than ever before, the need has been realised of effecting a synthesis of the two opposed points of view, while at the same time the very real difficulties raised by this problem have led physicists to discuss questions which pass beyond the proper technique of their science, and merge with the general problems of philosophy.³³⁵

In a later passage from the same book, de Broglie writes:

In the psychological, ethical and social sphere an uncompromisingly rigid definition or argument often leads away from, rather than towards, Reality. It is true that the facts tend to assume a certain order within the framework supplied by our reason; but it is no more than a tendency, and the facts invariably overflow if the framework is too exactly defined ... Even in the most exact of all the natural sciences, in Physics, the need for margins of indeterminateness has repeatedly become apparent – a fact which it seems to us, is worthy of the attention of philosophers, since it may throw a new and illuminating light on the way in which the idealisations formed by our reason become adaptable to Reality.³³⁶

Again one sees a physicist sensing that while classical Newtonian physics had a way of representing reality as particulate, mechanical and precisely known (conforming to the left hemisphere's take), a view that is instead based on waves and fields, interconnectedness (entanglement) and intrinsic uncertainty (conforming to the take of the right hemisphere) has proved itself to be more veridical.

The unique and the contextual

And reality has further qualities that again require a right hemisphere, not left hemisphere, world-picture. 'Consciousness is specific: each experience is the particular way it is', write Tononi and Koch.³³⁷ And yet

by means of the unique consciousness – never by ignoring, circumventing, or worse still, opposing that uniqueness – we can arrive at that which *transcends* the personal. It is not an opposition but a dipole. And – in another right hemisphere-oriented characteristic – quantum phenomena are *contextual*. One cannot speak of ‘independent’ outcomes without the kind of attention used to examine contextual phenomena.³³⁸

What we have here is physicists, like philosophers before them, such as James and Bergson, intuiting by introspection the bipartite nature of the mind. James, like Bergson, always decades ahead of his time, had described, in 1890, what he indeed called ‘split’ modes of consciousness, ‘which coexist but mutually ignore each other and share the objects of knowledge between them, and – more remarkable still – are complementary’.³³⁹ Bergson promulgated, from the 1880s onwards, his understanding of the need for two opposed although complementary ways of knowing: a useful, but unfaithful, representation of the world, on the one hand, and a veridical apprehension of the deep nature of reality that is of limited utility, on the other.³⁴⁰ This is again a precise intuition of how the two hemispheres of the brain are required to work together.

The conformity of matter to mind here is, of course, only to be expected. Our capacity to understand the world will bear the imprint of the brain we use to do so. According to Eddington,

the subjective laws are a consequence of the conceptual frame of thought into which our observational knowledge is forced by our method of formulating it, and can be discovered *a priori* by scrutinising the frame of thought as well as *a posteriori* by examining the actual knowledge which has been forced into it. The characteristic form of the fundamental laws of physics is the stamp of subjectivity.³⁴¹

It might be asked, then, whether it is that we see the world as having this structure because our brains have the structure they do, or that our brains are so constructed because the world they have evolved to deal with has this structure. If I am right that matter arises from consciousness as a way of Nature coming to know herself, and if I am right that consciousness and the cosmos co-evolve, each furthering the becoming (the evolution) of

the other, the question is based on a false premise. Here von Weizsäcker expressed it well: ‘We can only understand nature if we think about her, and we can only think because our brain is built in accordance with nature’s laws’.³⁴² He also said, wisely, that ‘all our thinking about nature must necessarily move in circles or spirals’,³⁴³ suggesting that the linear mode of approach typical of the left hemisphere will not answer to the structure of nature.

Earlier in this book, I suggested that philosophy cannot escape being moulded by the particular cast of mind of the individual philosopher. It is of some interest that faced with the problems created by assuming a meaningless, mechanical universe – such as the existence of consciousness in it, the extraordinarily fine-tuning of the cosmos required to permit life, and the role of consciousness in determining outcomes in physical reality – several of the commonly touted responses from scientists and philosophers correspond uncannily closely to delusions occurring in schizophrenia and right hemisphere-deficit states, in other words in conditions of left hemisphere prepotency. In pointing this out, I am not, of course, ascribing pathology to those who espouse such theories. Rather, I am illustrating how every point of view, pathological or not, inevitably has its hemispheric predilections, and it is worth being aware of its genealogy. Those of the current establishment thinking in philosophy and materialist science are for the left hemisphere, to the virtual exclusion of all else: so when faced with phenomena hard to accommodate, the solutions offered would be likely to illustrate that hemispheric style. And they do.

The world as representation

The favoured theory of consciousness these days is internalism, the belief that what we experience is a representation inside the head of whatever ‘really’ exists outside it, as if projected on a screen and, presumably watched by – what? whom? This entails that reality is what the mathematics of physics describes, and that my sensory experience of the world is an illusion. Thus the theoretical skeleton world of physics and maths is more real than the empirical world. This is straight left hemisphere stuff; and, as Tim Parks and Riccardo Manzotti note, carries with it an

immediately recognisable tone of condescension, even of moral superiority, of the theorist over the supposedly naïve rest of us:

I recall now how the neuroscientist Christof Koch claims that our experience of color is ‘a con job’. David Eagleman talks about vision being the result of ‘fancy editing tricks’. The philosopher Eric Schwitzgebel accuses us of being ‘ignorant and prone to error’ about everything we see. A moral nuance is smuggled into the debate, as if there were something shabby and lazy in the way we see the world. It feels like we’re being blamed, or condescended to, for not perceiving things as science thinks we ought to. ³⁴⁴

This superior, complacent tone is characteristic of one who does not know what it is he doesn’t know. I have already given my view that there is no reason to dub our full experience of the world an illusion, while ascribing to the very partial mathematical description of the world the reality. I also believe internalism is a mistake, and that consciousness is located not inside us, but in a non-spatial ‘betweenness’ created by our attention and the object of our attention. It is, therefore, always a partial revelation – and partly, also, a creation of the act of experiencing – but our part in it does not negate its reality: that *is* reality. Reality is always *coming into* being. A true *presencing* of something, not just a *re-presentation*. But that is, as the reader will know, what we would predict the left hemisphere would make of experience.

Taken altogether, then, that in the discussion of consciousness, the Western mainstream favours a view of reality as a representation rather than a presencing; favours the abstract and disembodied over the sensory and embodied; and believes it has superior knowledge to the rest of us; all could be predicted from the dominance of the left hemisphere’s take in the world of cognitive science and philosophy, as elsewhere. That there is a ‘problem’ of consciousness at all is due to this left hemisphere-mindedness. The right hemisphere has no problem, in that it is already engaged with reality; what it encounters, the *Gestalt* it perceives, is then taken up by the left hemisphere, which now wants to be certain, at a meta-level, what this perception, this *Gestalt*, ‘really is’. And since the left hemisphere doesn’t recognise the existence of what is ‘outside’ itself, we end up with the dogma of internalism. Once again it sees consciousness as a thing, rather

than a process of connexion, or rather a betweenness, out of which such 'things' as we and the world we inhabit co-arise.

Zombies

Then, another fascinating phenomenon. The 'hard problem' gives rise in some minds to the reconceiving of apparently human subjects as zombies, a popular topic of current philosophical debate; in others to doubting the difference between people and machines, a widespread and even automatic assumption of modern neuroscience and cognitivist philosophy. This goes beyond playing with ideas. That we are effectively no different from zombies or machines is to some a revealing insight: similar conclusions are common in, indeed characteristic of, schizophrenia. An example I have already quoted is scarily close to some current philosophical positions: 'I'm actually deluding myself into thinking I could think ... I was actually searching my memory bank ... non-mechanical thinking? I can't conceive of that any more.'³⁴⁵

Most people who ever lived, and most people alive now around the world, would correctly consider these assessments of the human condition to be a sign, not of wise insight, but of madness. In the world of philosophy, they first showed up in the mind of Descartes, who found he had no means of disproving that the people he could see from his window were automata; and they have proved hard to dislodge from Western thinking ever since. Those who have followed the argument so far will know why that could not have avoided being the case, given the prevailing cast of mind.

Giovanni Stanghellini wrote a book about how the schizophrenic mind becomes possessed by such thoughts.³⁴⁶ It is easy to see: RD Laing reports a schizoid patient who saw his wife as a mechanism:

She was an 'it' because everything she did was a predictable, determined response. He would, for instance, tell her (it) an ordinary funny joke and when she (it) laughed this indicated her (its) entirely 'conditioned', robot-like nature ...³⁴⁷

This again, in its assumption of determinacy and empty mechanistic 'behaviour', reflects what is hardly even a parody of a certain not

uncommon scientific position.

Amongst other considerations, this is a natural consequence of the particular cast of mind enjoined on those who engage in science in the modern West. (Sophisticated science was successful, without espousing any such mindset, in China and the Middle East long before modern Western science took off in the seventeenth century.)³⁴⁸ In the current scientific paradigm, one of the key elements is the rigorous adoption of the third-person perspective. A corollary of this is the conceiving of mental life by cognitive scientists schematically from without, not phenomenologically from within. The ultimate case of this has to be the absurd dogma of behaviourism, now luckily no longer, as it was, *de rigueur*, in which interiority was altogether denied. But behaviourism has been replaced by something not obviously more human: cognitivist psychology, which is effectively psychology as a machine might try to ‘understand’ it.

Discriminating the animate from the inanimate depends heavily on the right hemisphere, especially on the right temporal lobe.³⁴⁹ And so does understanding of an instance as properly unique, not merely one of a series: which take us to two other, interestingly related, theoretical positions, the ‘multiverse’ hypothesis and the so-called ‘many worlds interpretation’ (MWI) of quantum mechanics. Both mimic reduplicative phenomena, which outside of philosophy and science are typically due to right hemisphere, typically right temporal lobe, damage.

Endlessly reduplicative phenomena

The multiverse hypothesis suggests that the explanation for the unimaginably intricate interrelationship of highly precise factors necessary to permit the evolution of life in the cosmos just happening to be present together and to the right extent is that, as long as you keep multiplying universes indefinitely, eventually you are bound to end up with one like this. It is worth setting the probability in context, because it shows that the number of such universes would have to be effectively infinite. Here is astrophysicist Lee Smolin:

We must understand how it came to be that the parameters that govern the elementary particles and their interactions are tuned and

balanced in such a way that a universe of such variety and complexity arises. Of course, it is always possible that this is just coincidence. Perhaps before going further we should ask just how probable is it that the universe created by randomly choosing parameters will contain stars. Given what we have already said it is simple to estimate this probability ... The answer, in round numbers, comes to about one chance in 10^{229} . To illustrate how truly ridiculous this number is, we might note that the part of the universe we can see from earth contains about 10^{22} stars which together contain about 10^{80} protons and neutrons. These numbers are gigantic, but they are infinitesimal compared to 10^{229} . In my opinion, a probability this tiny is not something we can let go unexplained. Luck will certainly not do here; we need some rational explanation of how something this unlikely turned out to be the case.³⁵⁰

That's just to get to a universe that could contain stars. It does not get us anywhere *near* life or consciousness (if you hold that they must, somehow, arise out of inert matter).

Indeed, to get to a universe at all, the ratio (known as N) of the gravitational force to the electrical force would have to be almost exactly $1:10^{36}$, otherwise nothing could exist. Then, the value of nuclear efficiency (ϵ) – the percentage mass of the nuclear constituents that is converted to heat when the nuclear constituents react via nuclear fusion to form heavier nuclei – is 0.007: if it had had a value of 0.006 there would be no other elements than hydrogen; if it had a value of 0.008, protons would have fused in the Big Bang, leaving no hydrogen: in either case, no universe.³⁵¹ As Stephen Hawking (who nonetheless did not believe in fine-tuning: see note), observed: 'If the rate of expansion one second after the Big Bang had been smaller by even one part in a hundred thousand million million, the universe would have re-collapsed before it ever reached its present size'.³⁵² Had it been just slightly larger, the universe would have flown apart without creating galaxies. Even a change of 0.4% in the strength of another force, the nucleon-nucleon force, would make carbon-based life impossible, 'since all the stars then would produce either almost solely carbon or oxygen, but could not produce both elements'.³⁵³ And so on through a number of

constants that have to be almost exactly what they in practice turn out to be for there to be something rather than nothing. Legendary astrophysicist Fred Hoyle famously remarked: ‘A commonsense interpretation of the facts suggests that a super-intellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature’.³⁵⁴ Astrophysicist Paul Davies’s view similarly is that ‘there is for me powerful evidence that there is something going on behind it all. It seems as though somebody has fine-tuned nature’s numbers to make the Universe ... the impression of design is overwhelming’.³⁵⁵ And for Einstein, the cosmos showed evidence of ‘an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection’.³⁵⁶

To get to life, things get worse – much, much worse. Wilczek wrote that

it is logically possible that parameters determined uniquely by abstract theoretical principles just happen to exhibit all the apparent fine-tunings required to produce, by a lucky coincidence, a universe containing complex condensed structures [such as is life]. But that, I think, really strains credulity.³⁵⁷

Wolfgang Pauli wrote the following to his fellow physicist Niels Bohr:

In discussions with biologists I met large difficulties when they apply the concept of ‘natural selection’ in a rather wide field, without being able to estimate the probability of the occurrence *in an empirically given time* of just those events, which have been important for the biological evolution. Treating the empirical time scale of the evolution theoretically as infinity they have then an easy game, apparently to avoid the concept of purposiveness. While they pretend to stay in this way completely ‘scientific’ and ‘rational’, they become actually very irrational, particularly because they use the word ‘chance’, not any longer combined with estimations of a mathematically defined probability, in its application to very rare single events more or less synonymous with the old word ‘miracle’.³⁵⁸

In fact, if the chances of getting a universe with stars are 10^{-229} , only what is effectively an infinity of universes will do if it is life we want. In an infinite number of universes, by definition, everything that can happen must happen, over and over again: problem solved! But just to invoke infinity as the ‘explanation’ of anything – because whatever it is you can imagine must happen repeatedly in infinity – is not only not a cogent explanation, it is not an explanation at all. It is also intrinsically unverifiable, which means that it is a matter of faith. ‘Of course’, writes Paul Davies, ‘one might find it easier to believe in an infinite array of universes than in an infinite Deity, but such a belief must rest on faith rather than observation.’³⁵⁹ Deity or not, ‘we cannot observe any of the properties of a multiverse ... as they have no causal effect on our universe ... The hypothesis that a multiverse *actually* exists will always be untestable,’ writes astrophysicist Luke Barnes.³⁶⁰ There is nothing wrong with that – unless one claims it is science, rather than faith.³⁶¹

While it is easy to talk about the concept of such an ‘infinite’, that is not the same as accepting the reality of anything infinite in this sense. David Hilbert famously argued that ‘the infinite is nowhere to be found in reality. It neither exists in nature nor provides a legitimate basis for rational thought ... The role that remains for the infinite to play is solely that of an idea ... which transcends all experience and which completes the concrete as a totality’.³⁶² Were it to exist, the consequences for science and philosophy would be devastating, since in a world where everything is true, nothing is true. As cosmologist and mathematician George Ellis and his colleagues have pointed out, multiverses offer not an explanation, but an infinite regress. A coherent description of a multiverse is possible only through the existence of certain regularities of structure and origin: ‘a multiverse consisting of completely causally disconnected universes is a problematic concept.’³⁶³ And, if there are regularities, we are faced with the same problems that apply in the universe we have: ‘What would explain the existence of an ensemble, and its specific properties? Why should there be this particular ensemble, rather than some other one? Why this multiverse with these properties rather than others? What endows these with existence and with this particular type of overall order? What are the ultimate boundaries of possibility – what makes something possible, even though it may never be realised?’³⁶⁴ To quote theoretical physicist Paul Steinhardt:

Scientists proposed the multiverse as a way of resolving deep issues about the nature of existence, but the proposal leaves the ultimate issues unresolved. All the same issues that arise in relation to the universe arise again in relation to the multiverse. If the multiverse exists, did it come into existence through necessity, chance or purpose? That is a metaphysical question that no physical theory can answer for either the universe or the multiverse.³⁶⁵

On this situation the mathematician Martin Gardner commented wryly:

The stark truth is that there is not the slightest shred of reliable evidence that there is any universe other than the one we are in. No multiverse theory has so far provided a prediction that can be tested ... As far as we can tell, universes are not as plentiful as even *two* blackberries. Surely the conjecture that there is just one universe and its creator is infinitely simpler and easier to believe than that there are countless billions upon billions of worlds, constantly increasing in number and created by nobody. I can only marvel at the low state to which today's philosophy of science has fallen.³⁶⁶

‘Simpler and easier to believe’ because it is a more rational deduction. Still, my purpose here is not to debate the correctness of the multiverse theory – I will have more to say about it in a later chapter – but to draw attention to its interesting structure.

The ‘many worlds’ hypothesis has a similar structure. It supposes that every time there is quantum collapse, leading to an event occurring one way rather than another (eg, Schrödinger’s cat being either dead or alive, but not both), what actually happens is that both outcomes occur: the universe splits, and in one new universe the cat is alive, while in the other the cat is dead. Such moments of collapse lie behind all phenomena everywhere for all time – every single change in the cosmos – and the numbers expand exponentially with each universal split, so the number of universes being created every nanosecond by changes in my body alone is beyond all conception and beyond all measure, and might as well be considered infinite.

What lies behind this less than parsimonious fantasy is the nature of the quantum state as now conceived. It is not the case that a quantum system is actually in one or other of the possible states, and it's just that we cannot know which; the system is in some sense permitted to be in all states at once. This leads to the problem of where all the other states go when the wave function collapses. According to physicist Max Tegmark, 'the act of making a decision' – a measurement generating a particular outcome – 'causes a person to split into multiple copies'.³⁶⁷ But as Philip Ball suggests, this is incoherent. 'What can it mean to say that splittings generate copies of me?'

In what sense are those other copies 'me?' ... Tegmark waxes lyrical about his copies: 'I feel a strong kinship with parallel Maxes, even though I never get to meet them. They share my values, my feelings, my memories – they're closer to me than brothers.' But this romantic picture has, in truth, rather little to do with the realities of the Many Worlds Interpretation. The 'quantum brothers' are an infinitesimally small sample cherry-picked for congruence with our popular fantasies. What about all those 'copies' differing in details graduating from the trivial to the utterly transformative?³⁶⁸

The phrase 'feeling a strong kinship – closer to me than brothers', perhaps intended to humanise this inhuman vision, has for me the chilling, reverse, effect. And it seems hard to know how to make the picture coherent. Under these circumstances there can be 'neither facts nor a you who observes them', as Ball points out:

It says that our unique experience as individuals is not simply a bit imperfect, a bit unreliable and fuzzy, but is a complete illusion. If we really pursue that idea, rather than pretending that it gives us quantum siblings, we find ourselves unable to say anything about anything that can be considered a meaningful truth ... Its implications undermine a scientific description of the world far more seriously than do those of any of its rivals ... it destroys any credible account of what an observer can possibly be.³⁶⁹

Strikingly, a schizophrenic patient of Bin Kimura's reported that 'whenever one perceives anything, it bifurcates: at that instant the world is split in two ... I think it's plausible that there are other 'I's.'³⁷⁰ Thus he thought that when he had cleaned his teeth, there was one world in which he had, and one in which he hadn't. This is almost exactly a 'many worlds' theory. Fantasies of multiple copies of the self are sometimes the left hemisphere's attempt to make sense of a changing world in the presence of right hemisphere dysfunction: remember, for example, the man who had eight copies of himself and his wife and children in eight different cities where all the circumstances of his life were somehow replicated, though subtly different; or the patient who had 50 'twinnies'. Again, let me emphasise – I am absolutely not suggesting that the MWI is evidence of a delusional mind. But in light of the way in which many paradoxes illuminate the clash between left hemisphere and right hemisphere ontology it seems worth pointing out that such resolutions of the paradoxical character of the quantum world, and the multiverse response to the appearance of rightness in the cosmos, have structure that speaks of left hemisphere epistemology and ontology.³⁷¹

CAN WE TALK ABOUT THE TOPIC AT ALL?

I am aware that talk about consciousness and its relation to reality is foolhardy. The topic defies language. However, for that very reason, it is not irrational to push the bounds of language and thought, and if I seem to have done so here, perhaps I may be forgiven. I'd just say that I do so less than most alternative theorists. I do not claim to know what experience *is* any more than anyone else, except that it is the condition on which I know anything at all. And yet we all understand it directly. It is what we know (*kennen*) better than anything at all, and yet know (*wissen*) least of all about. It is therefore difficult to discuss, since neither language nor reason are well adapted to it. Language is already at a remove from direct experience. Bryan Magee captures the difficulties:

this direct experience which is never adequately communicable in words is the only knowledge we ever fully have. *That* is our one and only true, unadulterated, direct and immediate form of knowledge of the world, wholly possessed, uniquely ours. People who are rich in that are rich in lived life. But the very putting of it into words translates it into something of the second order, something derived, watered down, abstracted, generalised, publicly shareable. People who live most of their outer or inner lives in terms that are expressible in language – for example, people who live at the level of concepts, or in a world of ideas – are living a life in which everything is simplified and reduced, emptied of what makes it lived, purged of what makes it unique and theirs.³⁷²

I quoted Bohr as saying: 'We must be clear that, when it comes to atoms, language can be used only as in poetry. The poet, too, is not nearly so concerned with describing facts as with *creating images* and *establishing mental connections*.'³⁷³ That means the language of science alone is not going to deliver an understanding of ultimate reality. As Sam Matlack puts it: 'if poetry is necessary for talking about the foundations of physical reality, this should both elevate the importance of poetry and help to disabuse us of the idea that we can exclude the more personal, parochial,

poetic forms of language and still truly apprehend reality. Far from making poetic speech a mere means of translating a scientific message, talking about the constitution of the physical world must be poetic in some way.’³⁷⁴

Language is no match for the topic. And reason cannot reach the depths of experience, either. ‘We have to confess’, writes James,

that the part of [mental life] of which rationalism can give an account is relatively superficial. It is the part that has the *prestige* undoubtedly, for it has the loquacity, it can challenge you for proofs, and chop logic and put you down with words. But it will fail to convince or convert you all the same ... if you have intuitions at all, they come from a deeper level of your nature than the loquacious level which rationalism inhabits.³⁷⁵

Strawson would probably agree: ‘discursive thought is not adequate to the nature of reality: we can see that it doesn’t get things right although we can’t help persisting with it ... the nature of reality is in fundamental respects beyond discursive grasp.’³⁷⁶ Marcelo Gleiser puts it with panache: ‘Unless you are intellectually numb, you can’t escape the awe-inspiring feeling that the essence of reality is unknowable.’³⁷⁷

Rather famously the psychologist Stuart Sutherland wrote in the *International Dictionary of Psychology*: ‘Consciousness is a fascinating but elusive phenomenon; it is impossible to specify what it is, what it does, or why it evolved. Nothing worth reading has been written on it.’ I cannot hope to have been an exception to this rule.

VALUE

Where in the Schrödinger equation do you put the joy of being alive?

—*Eugen Wigner*¹

The whole universe appears as an infinite storm of beauty...

—*John Muir*²

Truth, outlasts the Sun –

—*Emily Dickinson*³

WHAT LIFE BRINGS, I WOULD MAINTAIN, IS NOT CONSCIOUSNESS, THEN – which, as I have argued, is present from the beginning – but the coming into being of the capacity for *value*: thus, a mountain cannot value, though it can have value for creatures, like ourselves, who value. And it is not just we, but all living creatures, that for the first time are able to recognise value. Life vastly enhances the degree of responsiveness of, to and within, the world.

The customary way to think of values is to see them as piggy-backing on and arising out of our consciousness: a human invention. An alternative view is that values are not invented but discovered and disclosed, and it

takes life to discover and disclose them: that they declare themselves in and through the responses of living beings to the world and the world's response to them. 'Value', writes Thomas Nagel, 'is not just an accidental side-effect of life; rather, there is life because life is a necessary condition of value.'⁴ Valuing depends on a relationship; only in its appreciation is value fulfilled. But it is not we who originate the possibility of truth, or goodness, or the beauty of the cosmos. We help fulfil them (or not). I see value as intrinsic to the universe; and the possibility of appreciating and responding to value – therefore fulfilling its potential – as one reason for the cosmos having evolved life.⁵ Indeed, life could be seen as the very process of the cosmic consciousness continually both discovering and furthering its beauty, truth, and goodness; both contemplating and (not separately but in the same indivisible act) bringing them further into being: a process.

This is not surprising if awareness is foundational to the universe, rather than arising from it late in the day. And this is a point on which Schelling and contemporary science could be seen as coming together. As Theise and Kafatos put it, 'the universe is non-material, self-organizing throughout, comprised of a holarchy of complementary, process-driven, recursive phenomena. *The universe is both its own first observer and subject.*'⁶ Though they make no reference to Schelling, or even to his philosophical era, this is uncannily close, 200 years on, to the structure of the world envisaged in Schelling's philosophy.

What are values? 'There is something in common between truth, beauty, and goodness', writes Andrew Steane, Professor of Physics at Oxford: 'they each make demands on us, and also fulfil us, and also leave us thirsty for more.'⁷ Values evoke a response in us and call us to some end. They are what give meaning to life: such things as beauty, goodness, truth – and purpose. Science can tell us what their brain correlates may be, but cannot help us understand their nature. It can, though, help us misunderstand them. This is for two main reasons.

One is that science starts where values leave off. Having for good reasons done its best to exclude from its view of the world any consideration of value, it finds no value in the world to consider. Purporting to eschew value in its workings, it implies that values are secondary phenomena that are, so to speak, painted on afterwards to suit human predilection, and, to that extent, obscure the primary reality. This, I will

argue, is back to front; and contrary to the day-to-day practice of science, which so clearly implies value, if only that of truth, at its core.

The other reason is that when science turns its gaze directly on values, it immediately begins to account for them in terms of something else assumed to be more fundamental. But for ultimate values there can be no such thing, much as there can be no such thing in the case of consciousness. In an age when it is widely thought that science alone can answer our questions, values may therefore become overlooked – and even devalued. Not a few readers for example, may be surprised by my including value alongside time, space, motion, consciousness and matter as a constitutive element of reality. Yet I believe it is as foundational as consciousness. It is, I suggest, at least worth seeing what follows if we abandon our usual assumptions on the matter.

CONCERNING TRUTH

An earlier chapter addressed the nature of truth, and the difference between the take on it of the right and left hemisphere. Moreover the theme of this entire book has concerned the comparative reliability – the truth – of what each hemisphere permits us to encounter. So I will make relatively few observations here.

In this, and each of the subsequent sections of this chapter – on goodness and beauty – I am making two principal claims. The main claim is that value, whether it is truth, goodness or beauty, is not, as our culture has come to regard it, an ‘add-on’, a human invention, some sort of extra that is not intrinsic to the nature of the cosmos, but is, rather, itself constitutive of the cosmos and is discovered by, and disclosed in, the encounter of life (and not just human life) with whatever it is that exists. The attendant claim is that that encounter is best served – indeed, served only – by the right hemisphere, optimally when it is assisted by the left; and if, on the contrary, the left hemisphere usurps the right hemisphere and ‘goes it alone’, it will not only fail to comprehend what is true, good or beautiful, but, by misconceiving it, help to destroy it.

With that in mind, let us look at the nature of truth.

Science is a product of a human aspiration which is difficult to explain in purely scientific terms: a desire to know, and to acquire knowledge for its own sake, not just for the sake of some useful purpose. Of course science has values of its own, just as it has very real value in itself. Values are what command our allegiance. Contemporary science seems to me governed by one overarching value, and an unquestioned assumption that governs how that value is interpreted. The value is, of course, truth: a value that is essential, timeless, and of the highest importance. By contrast, the assumption is adventitious and culture-bound: that truth requires maintaining an ideal of meaninglessness – or to put it more positively, the avoidance at all costs of implying meaning in the world. A piece of work may still be science if it is wrong – science advances necessarily error by error; but it will not be accepted as science if it imputes meaning to the processes of the cosmos or of life. For that would have the unwelcome implication that meaning is not something we need to *invent*, if, for

emotional reasons, we feel we must; but something we need, perhaps urgently, to *discover*, unless, for emotional reasons, we feel we must not. I do understand the reaction against premature attribution of meaning, which is often irrational. But not all attribution of meaning is premature, and it would be in itself irrational to deny meaning if it were present. We need to keep an open mind.

Truth carries within it the whole purpose of science, and gives meaning to its activities. However, science will not admit anything that is not empirically verifiable – yet the value of truth, like all value, is incapable of empirical proof. It is, instead, quite correctly, assumed. But that leaves the door open to an important question. Where does the overwhelming intuition – for that is what it is – of the over-riding import of truth come from?

It cannot come from utility. Some untruths might have greater utility than the truth. Suppose, for example, it were true that people derived great comfort in their darkest moments from a belief in an afterlife, which also encouraged them, more than they might otherwise, to lead a moral life and do good to others. Suppose you felt strongly that they were wrong because life, according to you, is pointless, matter is all that exists, and the cosmos is meaningless. My question is, why would your truth be so much more important than this human benefit?⁸ I think truth matters more than utility, because I see truth as an ultimate value, irreducible to anything else: that is part of my view of the cosmos as pregnant with meaning, soliciting our allegiance, rather than a place where it is good enough to get by with comfortable lies. For me, values are part of its very fabric, not optional adornments. But why would those who do not share such a belief in ultimate value think so? In a meaningless universe, without ultimate values, shouldn't we just maximise happiness? Where does this idea of a transcendent truth that surpasses all other considerations, including those of the greater happiness of others, come from? Or is the defence that *ultimately* only truths can make the world a happier place? How on earth could we know that? In any case, do you believe that scientists for the most part really value truth only instrumentally, rather than for and in itself?

Why for that matter believe in reason as a guide to truth, let alone the only guide to truth? I believe it helps us approach truth because I believe the cosmos has meaning, I believe reason is an aspect of its coherence, which both grounds it and which it in turn grounds, and I believe we are an expression of that cosmos. But if rationality is simply a derivative of

evolution in a meaningless universe, why trust it to disclose reality rather than be simply a useful tool developed through evolution for getting by, regardless of any deeper relationship to truth? Indeed it has been argued by evolutionary psychologists that reason evolved purely as a useful weapon for winning arguments, without regard for truth. Useful assumptions are not always truthful; equally, true assumptions are not always of practical use.

What, then, once again, is truth? And – a question jesting Pilate did not even stay to ask – where does it come *from*? My view, as laid out earlier in the book, is that truth (cf *troth*) is an act; one of trust in, or faithfulness towards, whatever *is*. It characterises the proper relationship between consciousness and the world. It is therefore not a function of some other value. Nonetheless it does imply that being faithful – though not blindly so – has value in and of itself; and that the ‘something else’ to which we are faithful also has intrinsic value, perhaps goodness or beauty, or the faith would be blind. In other words, rather than closing down on a single foundational element in a causal chain, we find this process leading in the opposite direction, to a web of interconnectedness that we cannot by any means get behind, or beneath, in which values cohere and sustain one another. This web of values is foundational, underwriting the meaning of our actions – including those of the reductionist, though he won’t be aware of it. Kant believed not in moral values because there was a God, but in God because there were moral values: not in a rule-engendering Nobodaddy in the sky, that we had better obey, but in an ultimate moral force in the universe to which we are intrinsically attracted. Truth is a moral value, like beauty, and goodness. Only our familiarity with truth, beauty and goodness makes us take them for granted; but they didn’t have to exist at all. We miss their essentially mysterious – indeed essentially good, beautiful and true – nature.

Not all values are fundamental in this way. In particular utilitarian values are not: they are derived from the value of pleasure. But some, like beauty and goodness – and indeed meaning and purpose, as I shall later suggest – are not derivable in this way. Even if they led to suffering we would be right to hold them as non-negotiable, and indeed to hold them in reverence. To value such values.

Are values useful *for* something else, or to be prized for their own sake? Are good deeds only a useful investment in the expectation of future help from others? Is beauty merely a scheme for selecting healthy mates? Is a

love of truth simply what gives us power over nature? Are courage and heroism either blind risk-taking or bids for admiration? The point at issue here is a very familiar one, so I shall not labour it – how instrumentality limits and degrades whatever it touches, be that art, nature or human beings themselves. Values are not just validated by the outcomes they achieve: they are inseparable from our deepest emotional experience. This does not make them suspect: rather they become suspect precisely when emotions have not played a sufficiently large part in their application, since emotions can take into account a host of implicit considerations that abstract argument would miss. What passes through my mind in making a judgment is not only, or even to any great extent, what passes through it consciously and explicitly: the judgment is a distillate of ever-growing experience. And when we disregard that fullness of experience we dehumanise what we describe and rob it of the value we are intent on pinning down.

The Victorian poet Coventry Patmore wrote a poem about truth. In it he writes of watching the tides come and go on the shore, and reflects:

For want of me the world's course will not fail;
When all its work is done, the lie shall rot,
The truth is great, and shall prevail,
When none cares whether it prevail or not.⁹

Truth is not a human invention. It is possible to construe both truth and falsehood as having meaning only in relation to assertions in language, but that is to miss their depth – and what is more their essential asymmetry. There will be truth when we are no longer around to see it, but there will be no falsehood: the lie shall rot. It takes a human to lie.

In the words of Emily Dickinson,

Truth – is as old as God –
His Twin Identity
And will endure as long as He
A Co-Eternity.¹⁰

The fascination with and love for truth is something deep in us, which in science and philosophy responds to the world with wonder and

excitement, as if exploring ever deeper an enchanted realm. Truth is not a thing to be possessed, however immaterial, but a path to follow, a process. 'It is not the possession of truth', according to Max Planck, 'but the success which attends the seeking after it, that enriches the seeker and brings happiness to him'. He was anticipated by the eighteenth-century German philosopher Lessing:

The true value of a man is not determined by his possession, supposed or real, of truth, but rather by his sincere exertion to get to what lies behind the truth. It is not possession of the truth, but rather the pursuit of truth by which he extends his powers and in which his ever-growing perfectibility is to be found. Possession makes one *passive, indolent, vain* – If God held enclosed in his right hand all truth, and in his left hand the ever-living striving for truth, although with the qualification that I must for ever err, and said to me 'choose', I should humbly choose the left hand and say 'Father, give! pure truth is for thee alone.'¹¹

Note that Lessing's advice is to choose the hand that does the bidding of the right hemisphere. Psychopaths – and this is surely fascinating in itself – lie quite gratuitously and needlessly, *not* just instrumentally, so as to achieve a purpose; it is almost as if they reverence the lie. They care nothing for truth; and they cannot love or trust. They also have severe right hemisphere dysfunction.¹²

Truth, as Patmore suggests, is a value that exists whether we recognise it or not. I will argue that this is true of other values, such as beauty, goodness and purpose. Truth also exemplifies another aspect of value: that, as Goethe suggested, what we at first only dimly perceive calls forth in us the faculty whereby it *can* better be perceived, a faculty, what is more, that is susceptible of development through practice, and may not function at all if not practised at all. That faculty, however cognitive it may become (at some later stage and for some purposes), is based in emotional intelligence and practical wisdom (*phronēsis*), which it is the business of a sympathetically lived life to nurture. A value can be calibrated cognitively, but it itself is first *perceived* pre-cognitively, much as we perceive colour or a musical tone directly, not as a cognitive elaboration. In German the word

for perception is *Wahrnehmung*, literally truth-taking: Scheler introduced the word *Wertnehmung*, literally value-taking, as a parallel. His point was twofold: that value is a primal phenomenon, like colour – it speaks for itself; and, related to this, that it is a *Gestalt* and therefore cannot be decomposed into bits or parts, or steps or slices, but must be taken in as a whole.

There is an argument that love, too, is a value. But is it not, you may object, an emotional experience? If so, in this it is not different from other values. It might be objected that it is, surely, value that leads us to love something: love is *based* on value. This is true; but equally true is that value is based on love. Love is not merely a product of value, but also its foundation. Thus Scheler quotes Goethe:

‘One knows nothing save what one loves, and the deeper and more complete that knowledge, the stronger and livelier must be one’s love – indeed passion’ ... He repeated this thought in countless variations all his life.^{[13](#)}

Wisdom has many facets that distinguish it from our common conception of knowledge in the modern West, and one of these is that a true understanding requires a certain disposition of the mind towards its object. While it is decidedly not one of excessive attachment, it cannot be that of complete indifference, either. There is a sense in which an open affection for its object is as much a requirement for a deep understanding, as it is a product of it. Emerson reflected that ‘love is fabled to be blind, but to me it seems that kindness is necessary to perception’.^{[14](#)}

True understanding in other words already *presupposes* a connexion, rather than being the prerequisite of such a connexion. The order of precedence is wrong. Knowledge cannot be confirmed by some external criterion that is not itself already an object of knowledge: we can know ‘from the inside’ only, not ‘from the outside’. For there is no such outside. A hermeneutic circle is involved, which means access to knowledge cannot be made certain and definite, but requires a step of faith to get going at all. I say ‘step’, because the normal expression ‘leap of faith’ makes it sound potentially random, whereas random is the last thing it is. It is no more

random than one's willingness to trust an outstretched hand that enables one to cross a stream.¹⁵

The incoherent attempt to see things from the outside means that there is something excessively cold and alien about the Western idea of knowledge. Consider the three greatest acknowledged influences on Western thought of the last 150 years (and they are by no means the most icily objective of thinkers you could hope to find): Darwin, Marx and Freud.

Here is Freud writing to his colleague the psychoanalyst Oscar Pfister about his patients: 'I must tell you that in private life I have no patience at all with lunatics'.¹⁶ As Freud's colleague Sándor Ferenczi wrote, 'one learned from [Freud] and from his kind of technique'

various things that made one's life and work more comfortable: the calm, unemotional reserve; the unruffled assurance that one knows better; and the theories, the seeking and finding of the causes of failure in the patient instead of partly in ourselves ... and finally the pessimistic view, shared only with a few, that neurotics are a rabble [*Gesindel*], good only to support us financially and to allow us to learn from their cases: psychoanalysis as a therapy may be worthless.¹⁷

Then there is Karl Marx: what is one to say of this undoubtedly clever, but unattractive, self-obsessed tyrant? Certainly not that he loved his life's professed project, the improvement of the lot of the proletariat. He described the peasants as 'troglodytes',¹⁸ the workers as 'those asses', 'the rabble', 'the mob': and his acolyte Engels wrote to him, clearly anticipating approval, that 'the people are of no importance whatever'.¹⁹

And then there is poor Darwin, who, I believe, really did love the natural world that he observed, as evidenced by his consistent appreciation of its beauty; though even here the process of scientific detachment almost drove it out of him: as he wrote to his cousin William Fox,

I am at work at the second volume of the Cirripedia, of which creatures I am wonderfully tired. I hate a Barnacle as no man ever did before, not even a sailor in a slow-sailing ship.²⁰

His mind seemed to him to have become ‘a kind of machine for grinding general laws out of large collections of facts’: the capacity to wonder and to love seemed to have been lost. ‘A scientific man’, you will remember, ‘ought to have no wishes, no affections, – a mere heart of stone.’ This makes an interesting contrast with Thoreau’s approach to Nature, which, however, as he concedes, would not issue in a communication to the Royal Society.

It is not science *itself*, but something about the Western approach to understanding the world that demands this loss, and induces the antipathy for one’s subject evidenced by each of these otherwise important thinkers. The Japanese word *kansatsu*, used in scientific accounts of experiments where we would use the word ‘observe’, has implications of a relationship, and is closer in meaning to the word ‘gaze’, a word which we use only when we are in a state of rapt attention in which we lose ourselves, and feel connected to the other: indeed the syllable *kan* in *kansatsu* implies a ‘one-body-ness’ with the object of gaze.²¹

Not that all of the Western tradition demands that understanding should be based on a loss of connexion with its ‘object’. Thus Pascal:

instead of saying, when speaking of human things, that one must know them before one can love them, which has become a proverb, the saints say on the contrary, speaking of divine things, that one must love them in order to know them, and that no one attains the truth except by means of love ...²²

Similar sentiments have been expressed since the time of St Augustine, who said, ‘one may not enter into truth except by means of love’;²³ and St Anselm, whose saying *credo ut intelligam* – ‘I believe in order that I might understand’ – reverses the normal Western assumption.²⁴ As I have already pointed out, the modern notion of belief as propositional is not what is intended here: belief is not holding a proposition, but a disposition, an openness to trust, *in order that* one may experience, and therefore *know*. Conviction will come, if it comes at all, from experience – never from trading propositions: this is *credo* as *cor do* (‘I give my heart’).

Such recommendations are not, however, confined to religious contexts, in which they clearly have a particular application. Nor are they as

paradoxical as they may seem to the modern mind. For loving is not something that ‘just happens’, but something that like other kinds of understanding, can, and must, be learnt. So Nietzsche says, emphatically, that ‘*One must learn to love*’; and he compares it to achieving an understanding of a piece of music. At first, he says, one must ‘*learn to hear* a figure and melody at all,’ and be open to it, attend to it as a life in itself; then one needs effort and ‘good will to *tolerate* it in spite of its strangeness, to be patient with its appearance and expression, and kindhearted about its oddity.’²⁵

Only thus do we come, he says, to a point of becoming

its humble and enraptured lovers ... But this is what happens to us not only in music. That is how we have *learned to love* all things that we now love. In the end we are always rewarded for our good will, our patience, fairmindedness, and gentleness with what is strange; gradually it sheds its veil and turns out to be a new and indescribable beauty. That is *its thanks* for our hospitality.²⁶

Not to love is not fair-mindedness, but an unfairness in itself: a bias against. We cannot know anything without attending to it, and the nature of that attention alters what we find: so to avoid bias, our task is not to adopt a peculiarly alienating form of attention, but to be aware of how we attend. We need ‘necessary distance’, yes, but this is neither a closeness that blinds us, nor a distance that alienates. It is *that* for which we should strive.

And love is not just for the sake of the other – or even primarily for the sake of the other. It is rewarding, because it enables us to see something beautiful which without it we cannot understand. ‘Understanding and loving are inseparable’, wrote Erich Fromm: ‘if they are separate, it is a cerebral process and the door to essential understanding remains closed.’²⁷ Max Scheler asserted that ‘before he is an *ens cogitans*, or an *ens volens*, man is an *ens amans*’: that before he is a being that thinks, or a being that wants, he is a being that loves.²⁸

Scheler also cites Pascal as saying words to the effect that love must first *disclose* what reason then may judge. And he refers to

the common, and as far as I can see, specifically modern bourgeois judgement, prevalent since the Enlightenment, that ‘love makes one blind’, that all true knowledge of the world can rest only on *holding back* the emotions and simultaneously ignoring differences in value of the objects known.²⁹

It is not that Scheler thinks there is no place for detached analysis in certain kinds of knowledge. Clearly there is. His point is that this cannot be the first stage, but must be a subsequent stage, of acquiring knowledge, not the ground of the process. If one mistakes this first step, one sets off already on the wrong path to understanding. Whatever we see as value-free, according to Scheler, can be so only through an *already achieved process of abstraction*, whereby we have set aside the value-quality which, he claims, is not given after – not even at the same time as – but *before* the object fully discloses itself.

The philosopher Warren Heiti writes: ‘It is not value or meaning which is peculiar; on the contrary, it is the allegedly value-free fact which is “utterly different” from anything else in the universe.’³⁰ He is drawing here, not on Scheler, but on the writings of Simone Weil; and he goes on to point out that there is nothing mystical about the idea, which is, for example, central to the psychologist James Gibson’s widely accepted idea of affordances, which we have already encountered: those aspects of the environment that reveal directly and immediately its meaning for good or ill in the animal (or human)’s first single, whole, perception of it. Certain affective responses at least, such as whether we are attracted to something or not, occur before any cognitive processes: this is a phenomenon known as the primacy of affect.³¹ Affect may too readily be equated with emotion. Emotions are certainly part of affect, but are only part of it. Something much broader is implied: a way of attending to the world (or not attending to it), a way of relating to the world (or not relating to it), a stance, a disposition, towards the world – ultimately a ‘way of being’ in the world. The point is that for the world to ‘presence’ to us we already have to have adopted a disposition of our consciousness toward it, and the disposition determines the value, *including the situation in which we preclude it having value*. Such a stance is already *value-driven*.

Scheler called value the first ‘harbinger’ of the particular nature of anything:

while the object itself remains indistinct and unclear, its value may be distinct and clear already. Whenever we apprehend a situation, at the same moment, at a glance, we apprehend the unanalysed whole and, in this whole, its value.³²

Of this, the philosopher Guido Cusinato writes,

Value, then, is what announces the phenomenon and gives direction to the further unfolding of its expression. The nuances of value in an object are the primary elements that reach us, and, so to speak, the medium through which the form and meaning of the object come into being and declare themselves.³³

This does *not* mean that such value-ception is invariably correct – just that it is always there, immediately. Clear and correct perceiving is a learnable art: a skill like any other that comes with experience. And the acquisition of greater skill may not negate, so much as go some way to explicating (=unfolding), the original judgment. Thus Bergson says:

Where would the difference be between great art and pure fancy? If we reflect deeply upon what we feel as we look at a Turner or a Corot, we shall find that, if we accept them and admire them, it is because we had already perceived something of what they show us. But we had perceived without seeing.³⁴

By contrast the scholar/scientist, according to Scheler, is so used to imagining that the process works in reverse – valueless perception first, value merely ‘painted on’ later – that he doesn’t notice what he is doing:

in the scholar this kind of abstraction can become so habitual, so much his ‘second nature’, that he is in fact inclined to regard the value-free entity of both psychic and natural phenomena not only as more fundamental *in esse* than their value-qualities but even as preceding them in order of perception. Consequently he casts about,

on this false assumption, for some kind of ‘yardstick’ or ‘norms’ which might restore value-distinctions to his value-free entity.³⁵

The process described by Scheler – the casting about for some kind of yardstick – is the left hemisphere’s response to something it does not properly understand: ‘let’s account for it in terms of something else, something more accessible which we can measure’. Indeed, what I have been describing so far in this chapter is the difference between the left hemisphere take and the right hemisphere take on value (including truth). For the left hemisphere, value is something we *invent*; which is *separate* from and, as it were, painted onto the world; and whose function is *utility*. For the right hemisphere, on the other hand, value is something *intrinsic* to the cosmos; which is *disclosed* and responded to in a pre-cognitive take on the *Gestalt*; and is not, other than incidentally, in service of anything else.

This leads naturally to thoughts about the calculus of utility which operates in a certain kind of ethics. So let us turn, now, to what it means to be good.

CONCERNING GOODNESS

Here, in keeping with what has gone before, I suggest that the good is, like other values, part of the nature of a conscious cosmos, not some sort of human 'add-on' divorced from its constitution, as our Western culture has come to think of it; and furthermore that we depend on our right hemisphere for this constitutive good to be disclosed to us. If instead we rely on our left hemisphere we not only fail to apprehend it, but are led ultimately to destroy it.

The dominant approach to ethics in our culture is utilitarianism, the belief that what is good is so because it issues in utility (see Chapter 18). Given that the governing value of the left hemisphere is to aid manipulation of a creature's environment, this is exactly what we would expect, as the reader will recognise, if the left hemisphere were trying to give an account of what goodness might be. This move also turns whatever intimations of goodness and badness it receives from the right hemisphere into representations it can both control and measure; it substitutes for the complexity of reality a series of cause and effect mechanisms, with the ultimate focus on outcomes; it suggests that such outcomes can be assessed by calculation (the greatest happiness of the greatest number); and, in keeping with its lesser emotional and social intelligence, removes the essential interiority of morality and replaces it with externalities of the kind it prefers. It then calls itself objective, thereby implicitly trumping all competitor theories, and installs itself in university departments across the world.

We know that experimentally induced left hemisphere predominance (whether through left hemisphere activation or right hemisphere suppression) in a normal subject leads towards utilitarianism. Perhaps, champions of utilitarianism might argue, the right hemisphere is just not a very good judge of morality? Fortunately we know a good deal about the disposition of each hemisphere when it comes to questions of morality, and the picture is clear. I have reviewed earlier the evidence that the right hemisphere is the principal substrate for social and emotional understanding (see Chapter 6). Furthermore the right temporoparietal junction is of critical importance in the maintenance of a coherent sense of one's own embodied

self;³⁶ and the right inferior parietal lobe and right insula are crucial for a sense of owning one's actions (both may be areas of dysfunction in schizophrenia, causing subjects to believe that their own thoughts, feelings and actions belong to other people).³⁷ Since each of these elements – social and emotional understanding, and a robust sense of the self as agent, taking responsibility for his or her actions – are in turn central to morality, it is not surprising that a mass of research of differing kinds suggests strongly that the right hemisphere is more important for morality, too.³⁸

In Chapter 15 I alluded to the fact that with either the right temporoparietal junction or the right dorsolateral prefrontal cortex suppressed, normal subjects can be induced to misjudge a situation, attending only to the consequences, so that an accidental poisoning gets to be considered morally more culpable than a failed murder attempt. The right hemisphere is superior to the left hemisphere at 'theory of mind'; the capacity to understand what another person is thinking, an essential component of moral evaluation unless one is purely utilitarian in outlook. Both right hemisphere damage and frontal lobe damage are independently associated with more utilitarian judgments.³⁹ The abnormally high rate of utilitarian judgments observed in frontal brain-injured patients with deficits in emotional response suggests that their decisions are mostly *cognitive, intentional and conscious*, unaided by emotion.⁴⁰ Brain-injured patients tend to assess personal moral dilemmas based solely on cognitive criteria, 'conscious abstract reasoning processes and cost-benefit analysis'.⁴¹ Five studies specifically examining lateralisation of lesions, in particular of prefrontal lesions, and adequate response to emotionally demanding moral dilemmas have concluded that right hemisphere involvement is the critical factor.⁴² 'Normal judgments of morality require full interhemispheric integration of information critically supported by the right temporal parietal junction and right frontal processes'.⁴³ In moral decision-making, then, the right hemisphere is the more important: it takes into account intention and context.

As one might expect, an atypical pattern of moral judgments has independently been observed in patients with deficits in emotional understanding:⁴⁴ specifically, subjects with emotional blunting make more utilitarian judgments.⁴⁵ The tendency to adopt a calculating and utilitarian approach in judging moral issues is more marked in those with reduced

aversion to harming others,⁴⁶ lower trait empathy,⁴⁷ higher psychoticism (which is itself characterised by reduced empathy and emotional blunting),⁴⁸ a greater sense of the meaninglessness of life and greater Machiavellianism.⁴⁹ It is also characteristic of the moral thinking of psychopaths,⁵⁰ as well as subjects with schizophrenia.⁵¹ The fact that frontal lesions result in anger and frustration in specific circumstances appears to be related to a difficulty in processing the social emotions, such as compassion, shame and guilt, that are closely linked to moral values, and these are better understood by the right hemisphere.⁵²

Apologies to any philosopher who takes offence here, but these are findings that are hard to dismiss: what you make of them is up to you. As one research group points out, however, the widespread assumption in academic philosophy departments that utilitarianism is the appropriate framework by which to evaluate moral judgment and that individuals who endorse non-utilitarian solutions to moral dilemmas are committing an error, is a curious one. It leads to the ‘counterintuitive conclusion that those individuals who are least prone to moral errors also possess a set of psychological characteristics that many would consider prototypically immoral.’⁵³

In a number of experiments examining moral responses, those that were designated utilitarian were often driven, ‘not by concern for the greater good, but by a calculating, egoist, and broadly amoral outlook’, and ‘were strongly associated with ... primary psychopathy, rational egoism, and a lenient attitude toward clear moral transgressions’. Researchers repeatedly found ‘associations between “utilitarian” judgment and antisocial and self-centred traits, judgments and attitudes’.⁵⁴ Moreover, it was not just that such decisions tended to be associated with a certain type of personality, but that they might have widespread untoward consequences:

The kind of no-nonsense, tough-headed and unsentimental approach to morality that makes it easier for some people to dismiss entrenched moral intuitions may also drive them away from a more impartial, all-encompassing and personally demanding view of morality, and might even lead some to skepticism about morality itself.⁵⁵

Utilitarianism's stock-in-trade are scenarios designed to force unpalatable choices in an attempt to make us aware of our 'irrationality'. These are amusing, but have a number of problems associated with them. Here are a couple of well-known thought experiments:

A trolley is hurtling down a track towards five people. You are on a bridge under which it will pass, and you can stop it by putting something very heavy in front of it. As it happens, there is a very fat man next to you – your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save five. Should you proceed?

A doctor has five patients who are awaiting an organ transplant and who will die without it. Unfortunately, as of yet, there are no available organs. An innocent person visits the doctor for a check-up and he happens to be a perfect match for all five of the patients. The doctor is tempted to take the innocent person's organs, thereby causing him to die, so as to save the five patients. In doing this, he saves the lives of five persons by killing one. Should he do it?

That people calling themselves moral philosophers can seriously debate whether it might be right for the doctor to act in this way, and even in some cases conclude that he should – or even *must* – suggests that there is something very wrong with the way we do moral philosophy nowadays. If the road leads you to the wrong destination, take a different road.

The goodness or badness of what I do to you hangs on many things not involved in the calculus of thought experiments: what, for example, it does to me as a spiritual, emotional, cognitive, and physical whole, to be the perpetrator (for example, brutal treatment of animals also brutalises us), and what happens to the world at large in which we are inevitably embedded (a world in which doctors can't be trusted not to cannibalise you for spare parts) – neither of which considerations can be ultimately isolated from one another or from the impact on the victim. There are consequences that could in theory be taken into account, though they rarely are in practice because of the difficulty in knowing how much weight to give them. How do we know what guilt the person who pushes the fat man will feel later – perhaps for years? What if the man does not die, and does not even stop the trolley, but ends up horribly injured? It's no good stipulating certainties here – that

he must die, and that he must stop the trolley – and then hoping to deduce what our responses would be were such an unlikely situation to arise in real life. One reason that most people tend to look askance at utilitarian views of morality is that things are *intrinsically uncertain* in this world – something the right hemisphere is much better at understanding and accepting – and, on something so important as the ethics of killing, it is better to be guided by an intuition than to attempt to make a calculus.

As this suggests, the kind of thought experiments that seem to challenge our intuitions are not without their problems. First of all, in most thought experiments, the situation is unrealistically circumscribed, and taken out of context. What people say on a survey or in a seminar is not necessarily what they actually do when faced with the real-life experience. Often they cannot know how they would react until they have to do so. It is not to be expected that intuitions and judgments drawn from living and validated in life will apply to bizarre and extreme cases. Saying to people that they should somehow blind themselves to certain aspects of the thought experiment, or to assume that ‘other things are equal’, when in real life they couldn’t, cannot be a good way of assessing our moral principles in practice. Moral judgments are made by human intuitions that include *everything* we know from experience, and on an understanding of what would really be involved in the cases we are asked to respond to: we can’t just ‘exclude’ certain factors or ‘fix’ others at will. Once you stipulate that we live in a world where you can know things that in real life we cannot know – such as that the fat man will stop the trolley – you are not testing our intuitions fairly. In moral dilemmas we are not asked to act like omniscient beings, but like truly human beings. And the one precludes the other.

Such thought experiments seem to presume that we are machines that have no significant past or future, and do not ramify into the world around us. In a way which suggests an imbalance in favour of left hemisphere-dominant processes, the fashionable cognitivist thought experiments are too tightly circumscribed: in depth of time, space and emotion. The right hemisphere sees human individuals as existing over time, not just at a moment in time, beings therefore who have a past and a future held together by a coherent narrative on which significant actions could have an indelible impact. It sees them never as isolated entities, but rather as embedded in a complex web of relationships – as social beings, in other words, within a culture. And it sees them as not just cognitive mechanisms, but as fully

embodied and emotionally complex, with all that that entails. This makes us behave in ‘irrational’ ways, such as not maximising our benefits. (People may perform a task less well and with less commitment if given greater material rewards; and children’s intrinsic interest and motivation can be sapped by turning a task into an explicit means to an extrinsic reward.)⁵⁶

A further important problem is that they are not exercises in exploring what *might* be valid moral motivations and conclusions, since that is *assumed to be known at the outset*. Decisions are judged correct only in as far as they conform to the utilitarian calculus: all other answers are assumed to be fallaciously swayed by ‘irrational’ considerations. But we are feeling beings, and emotion and reason are not so easily separated. That is not because we are foolish, but because we have the capacity to be wise, since emotion and reason contribute to, and help constitute, one another.

To see the philosophical enterprise in general, and the utilitarian project in particular, as engaged in a war to the death with intuition is evolutionarily misconceived, philosophically sloppy and tactically foolish. Philosophy, if it’s not to be pure intellectual onanism, needs to deal with the substrate (intuitive humans) that it has, not the substrate that would, if it existed, fit more neatly in its equations. If utilitarianism wants a war with intuitions (and it does), it’s doomed: to embark on it is the conceit of Canute. Philosophy departments everywhere have embarrassingly wet feet; many are drowning ...⁵⁷

And what would it do to humanity – what would already have happened to humanity – if we really accepted that moral decisions could be made purely on a calculus?

From this perspective, utilitarianism could be seen as not so much a *kind* of moral philosophy, as an *alternative* to moral philosophy, in subjects with a disconnexion from the moral sense, for whom a purely cognitive approach is all that is left; rather as echolocation is not so much a kind of sight – though it may grow in time to feel like one – as an aid to orientation in the blind. Except that utilitarianism is much less reliable than echolocation. This is partly because it can at times lead to what are rightly perceived as revolting – or ‘repugnant’ – conclusions; partly because it is forced to attempt an unconvincing reduction of all values to pleasure or

utility; and partly because it involves the ‘turtles all the way down’ problem.⁵⁸ In other words, if you ask me to demonstrate why it is wrong to torture children for fun, the fault is not mine if every answer I give leads you to a further calculation, and a further question, so that consequently no answer can ever satisfy you.⁵⁹ The fault lies in the mind that posed the question. Can we really make a calculus of the pleasure gained by perhaps a large number of sadistic paedophiles against the suffering of one innocent child? The calculus of pain and pleasure not only fails us as a guide to goodness, but is in itself morally wrong as a way to approach the situation. There comes a point where one has to say ‘certain things are just wrong: if you can’t see it for yourself, I can’t help you’. Not all moral issues are like torturing children, and not many of them are independent of context, but this would certainly be one. As Charles Foster and Andrew McGee put it,

in the case of the moral certainties, there is nothing we can appeal to that is more certain than the belief itself. This claim is a *rational* claim; it is about what rationality would require in order for these beliefs to be susceptible to questioning. Far from it being the case, then, that we admit beliefs in our moral framework that escape the tribunal of reason, we instead claim that reason itself shows some beliefs to be beyond question. Some beliefs are beyond question in the sense that we just wouldn’t know what it means to raise doubts about them.⁶⁰

Moreover, as they point out, morality is not just reducible to evolutionary utility. Many of our commonly accepted rules and intuitions include beliefs that have no obvious evolutionary explanation; for example, that we should look after our elderly parents (it not being clear how caring for them, and keeping them alive and healthy, would have helped us propagate our genes, while the practice is a far from negligible drain on what might be scarce resources, and delays responsiveness in an emergency).

Given the extent and importance of the evidence of hemisphere differences concerning morality, and so as not to disrupt the argument, I have included a review of the evidence in Appendix 5, which the reader is encouraged to consult. There are three aspects to the matter. First, further

evidence confirms that the right hemisphere is much more important for reaching moral judgments: bizarre judgments arise when the person has to rely on left hemisphere input. Second, it demonstrates that the right hemisphere is more involved than the left in inhibition, an essential aspect of moral behaviour. And, third, it demonstrates the right hemisphere's involvement in promoting prosocial – and the left hemisphere's in promoting antisocial – behaviour. In the words of David Hecht, of University College London, 'moral and immoral thinking are associated with activity in the right hemisphere and left hemisphere, respectively.'⁶¹

I have more than once touched on the left hemisphere's tendency towards deterministic thinking. It is therefore of interest that a belief in determinism also leads, independently, to antisocial attitudes and behaviour, including increases in deceitfulness, aggressive behaviour, and selfishness, lower achievement levels, and an increased susceptibility to addiction.⁶²

A moral act is the expression of a moral being. It is not just about, or even mainly about, an outcome. What we call a morally good action is not a thing, but the result of the disposition of a morally good being towards the world. The great mediaeval philosopher and theologian Meister Eckhart had this to say:

People should not worry so much about what they have to do; they should consider rather what they are. If people and their ways were good, their deeds would shine brightly. If you are righteous, then your deeds will be righteous. Do not think to place holiness in doing; we should place holiness in being, for it is not the works that sanctify us, but we who should sanctify the works.⁶³

I am aware that, though Eckhart makes clear what is important, there is at least a *partially* self-referring loop here, because one part of discriminating what a good person is comes from knowledge of his deeds: 'by their fruits ye shall know them'. But that this circularity should be a problem, rather than part of the solution, is a consequence of the analytic quest to 'get to the bottom' of this thing called goodness, as though it were a mystery that had to be solved, and once we could string out a chain of reasoning in relation to it we would have captured it – and could calculate it. But morality is a nexus, not a chain. The disposition of mind (or of the

whole being, or soul) that led to an action is more important than the nonetheless clearly important consequences of the action – at least those that could be foreseen; and along with that the intuitive sense of our non-local, distributed being among the society to which we belong. All goes together, each as much a receiver from, as a contributor to, this nexus, in a way that looks like Escher's famous portrayal of hands drawing hands that draw hands into being: not like a piece of string.⁶⁴

TH Huxley exemplifies the misunderstanding of moral choice from the left hemisphere viewpoint. He claimed he would have preferred to be a machine, provided it thought and acted correctly, as though morality were purely about specifiable, explicit and programmable outcomes (left hemisphere fashion), rather than about a disposition towards the world (right hemisphere fashion):

I protest that if some great Power would agree to make me always think what is true and do what is right, on condition of being turned into a sort of clock and wound up every morning before I got out of bed, I should instantly close with the offer.⁶⁵

By definition, such 'thinking what is true' and 'doing what is right' could not be either, since neither truth nor moral 'rightness' is a thing we possess, but lies in a relationship to the particular circumstances in the world, in a choice with consequences. Huxley was a fascinating, contradictory character, in some senses repellent (his attitudes to the animal world, for example), but vulnerable, and in that respect sympathetic. He describes himself with a degree of revulsion at his own embodiment, as having 'a very pale, thin, lanky, ugly body ... with dreadfully long hair ... and a generally neglected style of attire'.⁶⁶ His love of the mechanical leaves one to speculate as to what psychopathology lay behind his personal philosophy of life:

As I grew older, my great desire was to be a mechanical engineer, but the fates were against this and, while very young, I commenced the study of medicine under a medical brother-in-law. But, though the Institute of Mechanical Engineers would certainly not own me, I am not sure that I have not all along been a sort of mechanical

engineer ... I am now occasionally horrified to think how very little I ever knew or cared about medicine as the art of healing. The only part of my professional course which really and deeply interested me was physiology, which is the mechanical engineering of living machines ...⁶⁷

Utilitarianism tends to lead to the overvaluing of individualistic pleasure and individualistic determination, otherwise known as autonomy. While each is a reasonable enough goal, each needs to be tempered with other considerations, since unmitigated pursuit of either is not only bad for society but bad for the individual. A pleasure-filled life is not the same as a happy life, and a happy life is not the same as a meaningful life.⁶⁸ Being happy is a matter of ‘feeling good’, which might, of course, be a sign of enlightenment; but it could signify ignorance, thoughtlessness, insensitivity, lack of insight into oneself, lack of empathy for others, and a healthy bank balance. That could well do the trick – as would being fortunate enough to be born with a serene temperament. As Wittgenstein said, or should have said if he didn’t, ‘I don’t know why we are here, but I’m pretty sure that it is not just in order to enjoy ourselves’. There are many other things that call to us and motivate us – in other words, other values.

Happiness cannot in any case successfully be pursued, since it comes as a by-product of forgetting oneself; and the attempt tends to lead, not to fulfilment, but to the pursuit of languid pleasure, in a process of diminishing returns known as the hedonic treadmill. Empty feelings of elation, such as are experienced in hypomanic episodes or with the help of alcohol or drugs, do not produce enduring happiness but more often its opposite. Ideally, hedonic happiness should be matched by eudaimonic well-being. Eudaimonia refers to the fulfilment resulting from a life well lived: this is virtue ethics, not just *feeling* good, but *being* and *doing* good and feeling fulfilled as a consequence. The Epicureans, who have lent their name to a form of hedonism, nonetheless advised moderation and the cultivation of modest needs and desires. Their goal was not hedonistic pleasure, which is fickle, transitory, and dependent on circumstance, but eudaimonic pleasure, which is more stable, tends to endure, and is less dependent on fate. It is no coincidence that happiness is about the present moment, independent of other moments, whereas meaning links events across time, thus integrating past, present, and future.

We need both, not just one, and they are not, once again, of symmetrical importance. People who report being happy but have little or no sense of meaning in their lives have the same gene expression patterns as people who are enduring chronic adversity, such as loneliness, bereavement, or poverty.⁶⁹ Meaning comes from an orientation to something bigger than the self. As Jung noted, ‘the least of things with a meaning is worth more in life than the greatest of things without it.’⁷⁰

A certain degree of self-respect is important; but the cult of self-esteem always seemed to me overrated. Now we have proof. Social psychologist Roy Baumeister, a promoter of the value of self-esteem in the 1980s, discovered that it doesn’t deliver on its promise. In fact the cult of self-esteem at all costs (as opposed to ‘if truly deserved’), seems too often to lead to mediocrity and an insufferable self-conceit. ‘After all these years,’ Baumeister commented, ‘my recommendation is this: forget about self-esteem and concentrate more on self-control and self-discipline. Recent work suggests this would be good for the individual and good for society, and might even be able to fill some of those promises that self-esteem once made but could not keep’.⁷¹ A better approach, Baumeister and his team have concluded, would be to boost self-esteem as a reward for ethical behaviour and worthy achievements.

Autonomy is another unusual preoccupation of our age. Too little is very obviously a social ill, and so it is certainly a worthy aim. But it may conflict with other important values, requiring us to qualify its application. There is a false antinomy between personal fulfilment and the fulfilment of others: we constitute society and society constitutes us. In a healthy society, the needs of self and others are as much as possible harmonised, and neither should be allowed to tyrannise the other. The main casualty of autonomy as a principle for reaching moral conclusions is a proper concern for the impact of an action on how we view humanity at large – on human dignity, to use an unfashionable term. For a deeply thought-provoking look at how this plays out in the courts of law, I recommend Charles Foster’s *Choosing Life, Choosing Death: The Tyranny of Autonomy in Medical Ethics and Law*:

The universal law of the medical autonomists is not geographically universal. In fact it is only to be found in a relatively small, highly educated part of the West. There is a wider point: autonomy itself

(as opposed to the universal liberal law at its heart) is a Western idea – mysterious to and frowned upon by those outside the West.⁷²

Which does not of course make it wrong, but may alert us to what it is that we are failing to take into account in our attempts to harmonise competing claims, a necessity for good moral decisions.⁷³

Autonomy may be a culturally local phenomenon, but it is not as if the majority of traditional moral values are primarily the product of enculturation. They lie much deeper than that. Most social codes embody what are known as deontological principles, that is, ideas concerning duty and obligation (the word ‘deontology’ is derived from the Greek word for duty, *δέον*, not from the Latin word for God, *deus*). These lead to judgments made on the basis of the intrinsic rightness or wrongness of an action, quite separately from its consequences – principles to which we are duty-bound to cleave. With few exceptions children do not have to be taught that murdering and torturing are wrong – they feel it intuitively: the exceptions should alert us to a serious problem. Indeed monkeys will starve themselves for days rather than shock another monkey.⁷⁴ Such self-denying responses, according to one of the researchers, are ‘observable throughout the animal kingdom’.⁷⁵ They come from an intuitive interaction between our minds and the world at large. The social behaviour of freely acting animals is too complex to fit the mechanistic scheme of behaviourists. Animals in social groups are not constantly fighting for supremacy, but expend a great deal of energy in making sure that the group as a whole is peaceful and successful. Altruism is common among animals of all kinds, and cannot always be explained away as kin selection: numerous species are known to take life-threatening risks to rescue other animals, not even those of their own species. Non-relatives help each other and form alliances that can properly be called friendships; and primates earn respect within a group in which they display kindly behaviour.⁷⁶ And, ultimately, animal bodies could be seen as societies of socially self-sacrificing bacteria, numbered in trillions.

The only reason we don’t acknowledge all this more readily is that we have been taught to think of nature as merely a blood-drenched battle, rather than a narrative in which co-operation and competition play important roles *together*. Humans are intuitively co-operative, as well as competitive. When we act intuitively we are most often gracious and

generous – it is further reflection that makes us selfish and greedy.⁷⁷
According to psychologists Jamil Zaki and Jason Mitchell,

rather than requiring control over instinctive selfishness, prosocial behavior appears to stem from processes that are intuitive, reflexive, and even automatic. These observations suggest that our understanding of prosociality should be revised to include the possibility that, in many cases, prosocial behavior – instead of requiring active control over our impulses – represents an impulse of its own.⁷⁸

If life were not essentially collaborative, it would not be possible at all. As Colin Tudge puts it:

Taken all in all, and in most circumstances, collaboration is the best survival tactic – and so we should expect Darwinian natural selection to favour collaborativeness. In the case of animals, which interact largely through physical contact, with all the hazards that this entails, we would expect natural selection to favour sociality: the ability to get along with others of one's own kind at a *personal* level (and sometimes with other creatures of different kinds). We would also expect that as evolution proceeds, the nature and the scope of the social relationships would become more and more intricate and more subtle. On the whole, this is precisely what we do find.⁷⁹

Joshua Greene, whose view is that 'moral judgment is just a brain process – that's precisely why it's possible for these researchers to influence it using electromagnetic pulses on the surface of the brain', and whose stated aim is to take morality and 'break it down in mechanical terms' so as to dismiss the existence of a soul,⁸⁰ found to his surprise that people's default position is honesty, not deception; and that honesty is not a matter of exercising will-power but of being effortlessly disposed to behave honestly. It is *deceit* that (with the exception of psychopaths) requires an effort. He and his fellow researchers found this 'somewhat surprising', having conducted a survey to assess its *a priori* plausibility, in which people

showed themselves inclined, as he was, to the more cynical view.⁸¹ And, of course, it should be obvious that altering moral judgment by altering the brain does not show that it is ‘just a brain process’, any more than any conceivable outcome of Greene’s experiment could either deny or affirm the existence of the soul.

Incidentally, I think it is fair to say that the prevailing cast of mind in reductionist science, whether biological or psychological, is effectively cynical. It takes the view that, for instance, where there is altruism it must be covert selfishness; that we are maximisers of our self-interest; that we are blind mechanisms. Philosopher David Stove writes:

There is a perennial human type to whom this belief [that no one ever acts intentionally except from motives of self-interest] is peculiarly and irresistibly congenial. It is almost never a woman. It is the kind of man who is deficient in generous or even disinterested impulses himself, and knows it, but keeps up his self-esteem by thinking that everyone else is really in the same case. He prides himself on having the perspicacity to realise, what most people disguise even from themselves, that everyone is selfish, and on having the uncommon candour not to conceal this unpleasant truth.⁸²

Cynicism, the negative belief that self-interest drives human behaviour, is associated with worse health outcomes, poorer psychological well-being and poorer economic well-being.⁸³ According to a survey of several hundred thousand people, most people believe the stereotype that cynics are smarter. However, on formal testing, people with high levels of cynicism have repeatedly been found to be less intelligent,⁸⁴ and have lower educational levels.⁸⁵ (This is one case in which a stereotype is false.) Intelligence and education help detect and avoid deceit in the first place, contributing to a more positive view of human nature, and a greater inclination to trust. Studies using trust games show that people typically earn more if they are willing to trust strangers.⁸⁶ Following subjects over time corroborates this, suggesting that ‘cynical individuals earn lower incomes due to their ineptitude for cooperation, and cynicism might therefore be not that smart in terms of financial success.’⁸⁷ Competent

adults tend to have cynical viewpoints only when it is warranted by a given social situation. Less competent individuals are more likely to be cynical across the board. Cynicism appears to be a coping strategy by the cognitively less gifted to avoid being duped by others.⁸⁸

If I ask myself why I do certain, in some sense altruistic, things, the answer that seems most apt is ‘because I don’t want to live in a world where ...’ I don’t want to live in a world where no ‘rational’ person voted, or made efforts to conserve energy, just because their contribution made no significant difference; I don’t want to live in a world where we turn our back on the weak, the suffering and the needy, because they are not productive; I don’t want to live in a world where we *always* counted the cost before engaging in acts of helping others. This acknowledges the fact that every decision we make is not just a response to a known and certain world, but is part of co-creating that world for what it is.

One response to these problems is deontology, with its focus on duty and obligation. But what are we to do when such duties conflict, as they often do in real life? Where our duty to save a life means causing an innocent person harm? Or only some lives can be saved? Any schema is compromised: deontology on its own is unable to help when duties conflict; utilitarianism cannot on its own provide justice for the few against the tyranny of the many. Both run the risk of encouraging an attitude that is too rigid and rule-based towards morality. ‘There is no such thing possible as an ethical philosophy dogmatically made up in advance’, wrote William James, ‘there can be no final truth in ethics ... until the last man has had his experience and said his say.’⁸⁹

If we need to temper the calculus, how, and on what authority, other than some intuitive sense, are we to make that compromise? As philosopher David Misselbrook asks,

How can one say that either [utilitarianism or deontology] is a theory that allows one to accurately understand moral principles if one then has to fix the argument in order to ensure the right result? And what faculty within us is able to tell that a particular outcome is wrong if we cannot deduce that by the use of our right moral model? ... When John Rawls feels the need to balance the deontological perspective with the utilitarian perspective, where does the need to balance the two come from? By what method of moral reasoning

have we discerned that either was not in balance in the first place?
How will I know the balanced result when I see it?⁹⁰

It seems to me that we need a better approach, one that takes seriously enough the inner perspective of the doer, not just the externally observed deed; and the *whole* of the doer's inner self, not just their attachment to principles or calculations. Indeed one based on *attitude* itself, and founded on the ontology of the right hemisphere. There is no escape from some dependency on intuition, a disclosure of something of the nature of the good, mediated by the right hemisphere. Such an approach must focus on being, more than doing. According to such an account what is primarily of importance is the moral character of the actor as a whole, bodied forth in actions in particular contexts. Its concern is not so much with outcomes alone, as attitudes, emotional and social understanding, sensitivities to context, personality and the choices that issue from them, as well as what it means to be a fulfilled human being balancing many competing considerations through the exercise of practical wisdom. Such an approach is called virtue ethics.

It is the strength and the weakness of virtue ethics – for no one approach can answer every objection – that there are no rules, leaving matters to judgment. Devoid of procedures that could ideally lead to the one correct answer, the left hemisphere is lost. But that is the very nature and purpose of judgment; it introduces a concept that is capable, precisely, of going beyond rules. The claim is not that it is impregnable, merely that it is better than any other option. The price of certainty is absurdity; the prize of uncertainty is wisdom.

As Misselbrook puts it,

virtue ethics is ethics for grown-ups living in a complex world, with far more than 50 shades of grey. As Beauchamp and Childress remark, 'we see disunity, conflict and moral ambiguity as pervasive aspects of the moral life. Untidiness, complexity and conflict are unfortunate features of communal living ...'⁹¹

We now see all over the world examples of social groups and individuals attempting to do what they have worked out is the right thing in

the abstract, and hence doing it for the wrong reason – with catastrophic results. In the words of Sartre, ‘evil is the systematic substitution of the abstract for the concrete’.⁹² From atheistic totalitarian regimes to religious extremists to ‘social justice warriors’, the perpetrators of callous crimes comfort themselves that they are acting out of noble motives, but are blind to their own inhumanity. Even at a much higher level of self-sublimation than evidenced in these displays of narcissism, theoretical right beliefs provide no guarantee of good-heartedness. Kretschmer makes a fascinating observation, that strikes me as true to experience, namely that schizoid personalities often display a striving

after the theoretical amelioration of mankind, after schematic, doctrinaire rules of life, after the betterment of the world, or the model education of their own children, often involving a stoic renunciation of all needs on the part of the individuals themselves. Altruistic self-sacrifice in the grandest possible style, especially for general impersonal ideals (socialism, teetotalism), is a specific characteristic of many schizoids ... on an average they themselves are surpassed by the cyclothymes in natural warm kind-heartedness towards individual men, and patient understanding of their peculiarities.⁹³

On which matter biologist Colin Tudge writes:

The [Christian] commandments may seem simply to be deontological, but in practice for the most part they are an exercise in virtue ethics ... what matters most in all religious ethics is the underlying attitude: and the attitude that all the great religions demand of us is always the same. *All* preach personal humility, and all teach what the Buddhists call compassion and Jesus called love. I suggest that these two – personal humility and compassion (and particularly compassion) – are indeed the most fundamental notions or feelings that underpin all moral codes, of everyone, whether they deem themselves to be ‘religious’ or not. We could (and I believe should) add a third: the sense of reverence towards all life and towards the universe as a whole.⁹⁴

In summary, the utilitarian approach, strongly linked to the left hemisphere, emphasises isolated events viewed from the outside; the virtue ethics approach, closer to the take of the right hemisphere, emphasises dispositions, processes and relationships viewed from the inside. It is hardly surprising that research demonstrates that seeing the bigger picture, including ‘intellectual appreciation of contexts broader than the issue, sensitivity to the possibility of change in social relations, intellectual humility and search for a compromise between different points of view’, leads to outcomes in which individual and societal interests are best harmonised, and are thus likely to command consent more widely and for longer.⁹⁵ And every aspect of this – seeing the big picture, sensitivity to broader contexts, intellectual humility, and the capacity for compromise – is better served by the right hemisphere than the left.

But my point is not just that the right hemisphere is superior to the left hemisphere with regard to ethics. That is the case: but there is a more important point. According to the left hemisphere’s model of reality, it is the author of all its experience, so that goodness, like truth, is its own invention. In intuiting, by contrast, what is good, the right hemisphere makes room for the idea that something that is not just its own invention, but part of the order of things, is being disclosed to us. It creates the disposition (of humility, love, and reverence) that allows it to respond to the good that is, I suggest, in some form constitutive of the cosmos, as is the consciousness that makes possible its apprehension, its intuition and its disclosure in the world.

CONCERNING BEAUTY

The dominant contemporary account of what the world is made of has a bit of a problem with beauty: it doesn't know what to make of it. It recognises that everyone talks about beauty, and that for many people beauty is terribly important to their lives. But how is it to be fitted in to an account that regards the cosmos as a meaningless, materialist affair functioning in a broadly deterministic manner of cause followed by effect? One ploy is to recruit beauty to the ranks of the one value which such a materialist account embraces, namely the value of utility. Specifically, it sees beauty as a necessary cog in the machinery of evolution: beauty serves as a means of ensuring sexual attraction and therefore the continuation of the evolutionary process. Problem solved.

Except that this doesn't solve the problem. In particular it begs the very first question: where does beauty come from? Natural selection and sexual selection cannot be the answers; they are the answers to a quite different question, namely, '*given* beauty, how might it be used to advantage?' Having described how bright colours and other adornments in flowers and animals, can be 'largely attributed to the agency of selection', as they clearly can, Darwin twice makes the same puzzled observation:

How the sense of beauty in its simplest form – that is, the reception of a peculiar kind of pleasure from certain colours, forms and sounds – was first developed in the mind of man and of the lower animals, is a very obscure subject ... how the sense of beauty in its simplest form was first acquired, – we do not know.⁹⁶

In this, as so often, he was, and remains, entirely right.

Moreover beauty in nature, and especially in humans, is not simply what evolutionary psychology would predict. Of course, it goes without saying that it plays an important role in reproductive success, since reproduction, more than any other element in life, requires attraction. To take the most obvious example, the colours of flowers are more attractive to insects that will help them propagate. But what is it that attracts and why? There are many aspects of the beauty of the forms of plants and trees – their

elegant, delicate or majestic shapes and forms – that go well beyond any such mechanism, are probably not apparent to the insect eye at all, and convey no additional advantage. So why are they so beautiful to humans, who do not share a common ancestor with insects? Why aren't they a matter of indifference to us? The colours and forms, and the sweet scents, of plants are extraordinarily beautiful to humans, but having a sense of their beauty serves no utility, and may even, in the case of attractive poisonous plants, be fatally deceptive. Why is the aesthetic sense of birds so similar to our own, not just blatant or tawdry? Birds could be ugly to us and it really wouldn't matter to our survival or theirs. Nor can it be that all living things are considered equally beautiful, as the case of bats, toads and spiders, despite their no doubt sincere aficionados, attests (and, for an ugly bird, just try the unfortunate shoe-billed stork). Why do we think there is a kind of beauty in the finest horse that could never be matched by the finest donkey, however attractive? Both animals have been useful to man in roughly the same degree.

Please note, I am absolutely not arguing that the beautiful colours of the flowers and birds, and all the other beauties of nature, were created by an engineering God for human delight. (I shall have more to say against the concept of an engineering God later.) As Darwin says,

Were the beautiful volute and cone shells of the Eocene epoch, and the gracefully sculptured ammonites of the Secondary period, created that man might ages afterwards admire them in his cabinet? Few objects are more beautiful than the minute siliceous cases of the diatomaceæ: were these created that they might be examined and admired under the higher powers of the microscope?

Clearly not: but what, then, *was* their beauty for?

Though Darwin himself accepted that animals and birds have a sense of beauty, neo-Darwinians deny that there is anything there other than the decoding of an informational signal about reproductive health, or a lure to copulation. The philosophical arguments here are complex, and perhaps one cannot be definite on the issue.⁹⁷ But one does not need to be, in order to see that reductionists have a dilemma. If they are forced to conclude that animals have an aesthetic sense that is over and above utilitarian functionality – a disposition to find certain colours or forms in themselves

attractive, so that that disposition could be then harnessed by utility in the first place – how do they account for it? This difficulty is avoided by denying it. But if they deny that animals have any such sense, then the appreciation of beauty, since it clearly exists in humans, must have *arisen* in humans; in which case why does it have so little to do with promoting *human* survival? Beauty in people is not at all the same as sexiness: there are many people who are beautiful without being at all sexually attractive, and many who are sexually attractive without being at all beautiful. More generally, epicene looks in men, not a sign of fertility, robustness or hierarchy dominance, have over a very long period been considered particularly beautiful by both sexes.⁹⁸ Equally, ideal feminine beauty is not a matter of vaunting the most exaggerated symbols of fertility. If it is a basic instinctual quality geared solely to reproductive success, why would it have changed in humans – and changed in an era when human survival was more precarious?

In landscape, it is indisputably true that sometimes the kind that is highly productive or offers shelter is considered beautiful, but by no means always. Often, in fact, wild and inhospitable places, mountains, oceans and deserts, have ravished the human spirit with their beauty. There is nothing less likely to fill the heart with longing than a Lincolnshire field full of cabbages. You may think this is a late, Romantic, judgment, and it is very well-known that some landscapes we now consider beautiful once inspired fear and awe; but sublimity is part of beauty, and the beauty of wild landscapes, mountains, gorges and forests, was celebrated from as early as the Han dynasty, spanning the third century BC to the third century AD, in China; Eucherius describes the desert of the Middle East as *speciosa* (‘strikingly beautiful’) in the fifth century AD; ⁹⁹ the Inuit have ancient words for the sheer beauty of the frozen wastes of their homeland; and so on.¹⁰⁰ All this has nothing whatever to do with the cultural phenomenon of Romanticism in eighteenth- and nineteenth-century Europe.

And that is only the tiniest beginning. There’s the beauty of a minor third, never mind of a Schubert piano sonata; of an elegant chess move; of a Zen gravel garden; of snow on a mountain top; of Euler’s equation $e^{i\pi} + 1 = 0$; of a crucifixion by Cimabue. Of course, I do not say that someone somewhere could not find a way to defend the idea that they are all by-products of reproductive signalling, because someone somewhere can

always be found to defend any point of view, however silly. But what on earth lies behind such an attempt?

In the last chapter I supported the view that it is more rational, and better in keeping with science, to suppose that matter arose out of consciousness than consciousness out of matter, and that what we experience is the way in which the cosmos becomes not only aware of itself, but becomes more itself. A logical view, then, is that value is the proper object of consciousness; that beauty is foundational, like truth and goodness, and is, like them, an aspect of the cosmos revealed to us *by* conscious life; and that it has been requisitioned by a massively important biological drive to its service, as just one of the many elements of human experience in which beauty plays a crucial part. I suspect that the appreciation of beauty is one of the things life is for: it is not surprising, then, that it plays a part in bringing life about. And just as human consciousness reveals goodness to be more than animal empathic sensibilities are able to encompass, without denying their reality, human consciousness reveals the sense of beauty to be more than an aid to procreational choices, without disputing that that is one of its roles.

If, then, utility fails to provide the prevailing materialist account of the cosmos with an adequate explanation for the phenomenon of beauty, how should that account regard beauty? D.H. Lawrence wrote that ‘science has a mysterious hatred of beauty, because it doesn’t fit in the cause and effect chain’.¹⁰¹ His point was not, of course, that scientists cannot appreciate beauty in their subject, but that scientific culture was and perhaps still is, committed to unweaving the rainbow by instrumentalising beauty: beauty becomes only the small part of it that can be revealed through the lens of functional use, what Lawrence calls the ‘cause and effect chain’. Moreover he was reacting to the obvious fact that, though Darwin constantly expressed astonishment at the beauty of nature (the world *beautiful* or *beauty* appears on average on every seventh page in *The Origin of Species*, and on every second page in *The Descent of Man*), there is no place for such language in the literally an-aesthetic writings that form the bulk of modern science literature.

In short, the prevailing account of the cosmos washes its hands of the phenomenon of beauty. Beauty is merely an extra, an add-on, something surplus to the requirements of the model. ‘Surplus’ is perhaps the most appropriate word to describe this view because it reflects a common attitude

that the appreciation and cultivation of beauty are a sort of luxury that can be afforded only once we have satisfied our most basic needs for survival. In any event, beauty is not central to anything that matters: it is a marginal affair.

But this account simply does not accord with what we know about the attitude to beauty of people with infinitely less of a material surplus than we modern Westerners enjoy.¹⁰² Receptiveness to, and valuation of beauty seem so deep in us that it could be said to be a primal instinct. Introduced by the remark of a stone-knapping expert that early flint tools were the work of ‘creative’ people who wanted to ‘make beautiful objects, not just functional objects’, Neil MacGregor, then Director of the British Museum, commented about the making of a series for the BBC called *A History of the World in 100 Objects*:

One of the greatest discoveries for me was that actually as soon as we start making things we start making beautiful things, that it looks as though even one and a half million years ago we want things to be beautiful, we want them to be complicated and we want that just as much, apparently, as wanting them to be fit for purpose.¹⁰³

Even the development of the use of metals seems to have been motivated primarily by their beauty rather than, as assumed, by their utility. According to the historian of technology Robert James Forbes, metal was at first prized for its fascinating beauty, and only subsequently found to have use.¹⁰⁴ Anthropologist Christopher Hallpike concurs: ‘The gold, copper, and iron our ancestors would have found in their pure or “native” state’, he writes,

would have been useless for practical purposes, being softer and blunter than flint, and also required the development of a whole new technology. So why did our Neolithic ancestors bother with metals at all? ... It is only because gold and copper are beautiful and rare that people initially treasured them, and were sufficiently motivated to explore their properties further ... It was man’s aesthetic sense, his love of self-decoration, and his desire to own rare and precious objects that was responsible for the early development of metallurgy

and ... of glass as well, long before their practical possibilities became obvious.¹⁰⁵

And he points out that ‘it was often the stimulus of *non-practical motives*, such as aesthetics, intellectual curiosity, magic and religion, pride and status, or entertainment’, that led to functional developments ‘that they would never have thought of in the ordinary work of daily life, or in relation to material needs.’¹⁰⁶ And as to beauty being only for the affluent, it is arguable that ugliness came into human life only with affluence. In fact, I’d venture to say that there are few artefacts or buildings that we know of prior to 1830 that would be generally considered ugly.¹⁰⁷ Such ugliness depends on the externalisation of a certain aspect of human thinking – one that has no intuitive understanding of proportion or *Gestalt*, but is focussed on parts, and intent on utility.¹⁰⁸

It seems, then, that beauty is an irreducible element in experience, and more fundamental than utility. Indeed it is particularly perverse to attempt to subordinate beauty to utility since one of the distinguishing features of beauty is that, as Kant pointed out, it pleases us disinterestedly. Exactly what marks it out, he says, is its purposiveness without presenting any purpose (*Zweckmäßigkeit ... ohne Vorstellung eines Zwecks*).¹⁰⁹ We *contemplate* the beautiful:

nor is this contemplation, as such, directed to concepts, for a judgment of taste is not a cognitive judgment (whether theoretical or practical) and hence is neither *based* on concepts, nor directed to them as *purposes* ... the liking involved in taste for the beautiful is disinterested and free, since we are not compelled to give our approval by any interest, whether of sense or of reason.¹¹⁰

Leibniz called beauty a ‘disinterested love’;¹¹¹ Burke, a form of love that is ‘different from desire’.¹¹² And this is not a sentiment confined to the Enlightenment. Marcus Aurelius said that ‘anything in any way beautiful derives its beauty from itself, and asks nothing beyond itself’.¹¹³ In this it is not different from other values. Seneca, as is well known, asserted that virtue is its own reward; and Spinoza that not happiness, but virtue itself,

was the prize of virtue.¹¹⁴ Values are not instrumental. That X has an effect Y does not make Y the purpose of X. For example, beauty relieves pain;¹¹⁵ but while that is a sign of its power, it does not explain the existence of beauty, or indicate that its purpose is analgesia.

In the words of Emily Dickinson,

Beauty—be not caused —It Is —

And she continues,

Chase it, and it ceases —

Chase it not, and it abides — ¹¹⁶

Since there is no formula for beauty, any more than there is for truth or goodness, it cannot be commanded, but must be wooed. And it is certainly not just about things that make us feel comfortable and safe. ‘Beauty’, wrote Rilke, ‘is nothing but the onset of terror we can only just bear, and which we admire in awe because it serenely disdains to destroy us.’¹¹⁷ In experiencing it — as in experiencing truth, goodness and a sense of purpose — we are aware of being in the presence of something greater than ourselves.

And, though it is said that beauty is in the eye of the beholder, that is only half the story: the eye must also *discover* the beauty that it could never create. Much as I argued that moral values, within certain limits, are universal, beauty is also more universal than we have been taught to think. Cross-cultural agreement is remarkable, even though the forms taken by beauty in art may differ widely in style.¹¹⁸ Westerners have no difficulty in responding to Japanese or Chinese aesthetics, nor do Far Easterners have difficulty in responding to Western aesthetics. Norwegians acculturated to a Western musical tradition make precisely the same associations between particular emotions and particular musical intervals as are made in Ancient Indian music — a radically different musical tradition.¹¹⁹ Generally Westerners and Easterners agree on what is beautiful in their respective cultures, though there are bound to be some differences. For me the most moving demonstration of the cultural universality of beauty is in a sequence made for French television, in which Amazonian tribesmen are exposed to

images of the modern Western world, and their reactions recorded. They express revulsion at almost everything – our treatment of our elderly, of animals and trees, our violation of the moon and our terribly destructive wars. In just one sequence, however, the tone changes dramatically. They are shown a clip of Maria Callas singing Bellini's 'Casta diva', and are asked what they think. The men are rapt. For the first time, someone stands up and moves towards the camera in order to speak. He is a young tribesman: 'This music is not our culture. We do not know what it means. We can only watch and listen. But we are touched by it.' And an elder continues: 'I find it overwhelming. Without understanding her, we sense that there is something sacred there.'¹²⁰

On a more banal level, agreement between individuals *from* different cultures about facial attractiveness *in* different cultures 'is one of the best-documented and most robust findings in facial attractiveness research since the 1970s'.¹²¹ Nor do children have to learn cultural norms in order to make beauty judgments. According to psychologist Stephen Ceci,

starting at seventy-two hours after birth, babies prefer to look at faces that have been rated as attractive over faces that have been rated as average or less attractive. It doesn't happen fifteen minutes after birth. It takes three days looking at faces that they form this sort of prototype of what a face should look like. But starting at seventy-two hours, scientists have shown that babies reliably prefer to look at faces that have been rated as attractive. The one caveat, though, is that they're not necessarily proportionate or symmetric faces.¹²²

I suggest that 72 hours is too short a time to arrive at a 'prototype' from experience. And of course you cannot expect a baby to prefer faces at 15 minutes: it has got to learn to see in daylight and become minimally oriented first. The beautiful face is not a 'prototype' or a stereotype, but an archetype. Only once or twice in a lifetime does one see the archetype of the beautiful female or male face realised, and then the experience is one of unforgettable awe.

Beauty is also constantly referred to by mathematicians, for whom its only consequence is delight: I discussed this in relation to mathematical

intuition in Chapter 19 – how often mathematicians and physicists were convinced of the rightness of a conclusion by its beauty, even though at the time they could not see why it must be correct, and perhaps even knew of evidence against it that only later was found to be mistaken. Music and mathematics are often compared: ‘mathematics is *the music of reason*’, according to mathematician Paul Lockhart.¹²³ The question arises whether this beauty is an adventitious quirk, or fundamental to the structure of reality: is maths, and its beauty, discovered, or invented? Astronomer Mario Livio writes: ‘Since the laws of nature have the elements of beauty engraved in them, it should come as no surprise that aesthetic principles played a major role in the shaping of our thinking about the origin of the universe.’¹²⁴ Here is the account of Paul Dirac (who, by the way, called himself an atheist):

It seems to be one of the fundamental features of nature that fundamental physical laws are described in terms of a mathematical theory of great beauty and power, needing quite a high standard of mathematics for one to understand it. You may wonder: Why is nature constructed along these lines? One can only answer that our present knowledge seems to show that nature is so constructed. We simply have to accept it. One could perhaps describe the situation by saying that God is a mathematician of a very high order, and He used very advanced mathematics in constructing the universe. Our feeble attempts at mathematics enable us to understand a bit of the universe, and as we proceed to develop higher and higher mathematics we can hope to understand the universe better.¹²⁵

In a similar vein, D’Arcy Thompson pronounced that ‘the harmony of the world is made manifest in form and number, and the heart and soul and all the poetry of natural philosophy are embodied in the concept of mathematical beauty.’¹²⁶ Anciently there was a perception that natural form is *intrinsically* beautiful. The word ‘cosmos’ was Pythagoras’s term and it originates in a stem that connotes order, harmony and beauty (of which the basest reflection only remains in our word ‘cosmetic’). I have earlier discussed the Chinese concept of *lǐ* (the form that is everywhere in the cosmos and is beautiful and right); the word *rupa* in Sanskrit means form,

but its deeper meaning is beauty;¹²⁷ and the Latin word *formosus*, from *forma*, a form, means beautiful (cf modern Italian and Portuguese *formoso*, and Spanish *hermoso*).

At the core of beauty is the capacity to lead us to truth, but also to destruction: its consequences are as often disruptive to, as confirmatory of, our proper goals. Of course, one might make beauty one's *only* goal, but in doing so one risks making a monster of oneself – callous without, desolate within. For it seems that beauty alone, though it addresses itself to the soul like little else, is not enough to sustain the soul, which requires also goodness and truth. If beauty were simply truth, and truth beauty, with due respect to Keats, we wouldn't have two very different concepts. They need their potential both for independence and for interdependence: each aspect of the relationship is real.

CS Peirce had this to say about the relation between goodness and beauty:

An ultimate end of action ... must be a state of things that reasonably recommends itself in itself aside from any ulterior consideration. It must be an admirable ideal, having the only kind of goodness that such an ideal can have; namely, aesthetic goodness. From this point of view the morally good appears as a particular species of the aesthetically good.¹²⁸

If it is true that goodness is a particular species of beauty, there is still certainly no equation here, since manifestly the beautiful is not always a species of good. To quote Tolstoy, 'it is amazing how complete is the delusion that beauty is goodness'.¹²⁹

In Appendix 5, I assess the left hemisphere's contribution to the appreciation of goodness, and in doing so considered three elements: its contribution to an understanding of what goodness, in the abstract, *is*; its role in making particular *judgments* of goodness in particular cases; and its immediate *value-cception* of goodness. In each of these the left hemisphere was inferior to the right hemisphere because of its tendency to rationalise and make explicit: that is not just my opinion – we have seen the evidence that this is so. With beauty, things are similar, yet slightly different. The left hemisphere's understanding of what beauty *is* tends, once again, toward a

rationalised, retrospective account in terms of utility. But specific judgments of beauty, and the sense of beauty, are harder to put into words, with the expectation that the left hemisphere will be less likely than it was in the case of goodness to be seduced into making *particular* judgments on the basis of principles of utility. So how do the hemispheres compare when it comes to appraising beauty?

Starting from first principles, the essence of beauty is harmony, including its judicious violations: appreciation, therefore, not of things, but the relations *between* things that are simultaneously similar but different. This is a strength of the right hemisphere. Furthermore, given that in art the ambiguous and unexpected are important aspects of aesthetic preference;¹³⁰ and given that the sense of beauty depends on understanding implicit meaning and gives rise to a response that one cannot entirely separate from emotion; and given that the beautiful, and the sublime, can never be made explicit; and given that beauty is the most embodied of all values; there seems to be a *prima facie* case that the right hemisphere is going to play an important role in aesthetics. Interestingly, Scott Thybony reports that ‘the Navajos have two ways of looking at the landscape. One’s with hard eyes and the other’s with soft eyes. Hard eyes are used when looking for things like game, water, pop machines. Soft eyes are used to take in the beauty of the scene.’¹³¹ This sounds very like the sharply defined gaze of the grasping left hemisphere (hard eyes) for acquisition, contrasted with the broad, open, receptive gaze of the right hemisphere (soft eyes) for appreciation of beauty.

There are a number of further characteristics of beauty that suggest it would be better understood by the right hemisphere than the left. Roger Scruton comments about beauty’s freedom from all goal-directed designs that ‘one sign of a disinterested attitude is that it does not regard its object as one among many possible substitutes’.¹³² The mind sees the beautiful as irreplaceable and *unique*: no two people are beautiful in the same way, whereas in, for example, a commercial enterprise they become fungible.

Another right hemisphere characteristic is that it pleases without *concepts*.¹³³ This is akin to Scheler’s view that beauty’s appeal is pre-cognitive. Scruton makes a distinction between what he calls the immediate, sensory, intuitive character of the experience of beauty and ‘the way in which an object comes before us’ more deliberately.¹³⁴ This looks like a distinction between the right hemisphere’s appreciation of beauty as

zuhanden, and the left hemisphere's attempt to deal with it once it becomes *vorhanden*.¹³⁵

Yet another right hemisphere characteristic is its *Gestalt* nature. My argument about goodness was that our sense of it does not come from the summation of component elements, but from a sense of the whole. Similarly with beauty. 'Recall the queasy feeling', writes Scruton, 'that ensues, when – for whatever reason – you suddenly see a *body part* where, until that moment, an embodied person had been standing. It is as though the body has, in that instant, become *opaque*.'¹³⁶ Beauty is a matter of seeing through the surface to the depth, seeing through the parts to see the whole. In Pope's famous phrase, 'Tis not a lip or eye we beauty call, / But the joint force and full result of all.'¹³⁷ And it was this that lay behind my argument, in an early book called *Against Criticism*, that works of art are *Gestalten*, which the analytic, explicit, abstracting process of criticism fails to account for and destroys. 'No one component of a film can have any meaning in isolation', wrote the great film director Andrei Tarkovsky: 'it is the film that is the work of art. And we can only talk about its components rather arbitrarily, dividing it up artificially for the sake of theoretical discussion.'¹³⁸

Yet another reason for supposing right hemisphere preponderance is beauty's link with the imagination, and its intrinsic ineffability. 'Things are pretty', wrote Emerson,

graceful, rich, elegant, handsome, but, until they speak to the imagination, not yet beautiful. This is the reason why beauty is still escaping out of all analysis. It is not yet possessed, it cannot be handled ... It instantly deserts possession ...¹³⁹

And his compatriot Emily Dickinson wrote in her lapidary fashion: 'The Definition of Beauty is / That Definition is none –'¹⁴⁰ This ineffability signals not just that it is beyond language, but beyond limitation, as poets have often attempted to convey:

Beauty is everlasting
and dust is for a time ...¹⁴¹

A thing of beauty is a joy forever ...¹⁴²

Estranged from Beauty – none can be –
For Beauty is Infinity – ¹⁴³

It also cannot be *used* in the service of knowledge, if knowledge is understood as *wissen*, rather than *kennen*. Art is how humans have expressed their sense of beauty, but it is the route to an understanding of what cannot appear as an object of knowledge. Rather we come to acquaint ourselves with something unique that may be understood only by experience. So, Tarkovsky says,

Some say that art helps man to know the world, like any other intellectual activity. I don't believe in this possibility of knowing ... Knowledge distracts us from our main purpose in life. The more we know the less we know; getting deeper our horizon becomes narrower. Art enriches man's own spiritual capabilities, and he can then rise above himself ...¹⁴⁴

And elsewhere,

The allotted function of art is not, as is often assumed, to put across ideas, to propagate thoughts, to serve as an example. The aim of art is to prepare a person for death, to plough and harrow his soul, rendering it capable of turning to good.¹⁴⁵

When it comes to discriminating the relative contribution of each hemisphere to our appreciation of beauty, there are almost insurmountable difficulties. How does one attempt to measure the correlates of beauty, as science inevitably must? To start with, aesthetic appreciation involves perception, emotion, intuition and cognition, in any of several modes or more together, and to differing degrees in different cases and in different individuals; emotions of pleasure, disgust, sadness, joy, or awe; and draws on responses to form, colour, sound, action, memory, associations with bodily sensations, sexual responses, action preparations, and much more.

Though musical appreciation is generally speaking more reliant on the right hemisphere, sad music activates the right hemisphere more greatly and happy music the left – both of them, however, beautiful.¹⁴⁶ Findings can also be skewed by the choice of comparator: with the ugly? the bland? the merely symmetrical? And with the nature of the stimuli: are we looking here at faces, landscapes, abstract patterns, nudes, or what?¹⁴⁷ Moreover, when subjects are asked to form a judgment, rather than merely experience, this radically alters which parts of the brain are involved.¹⁴⁸ And then there are differences between naïve and trained subjects (one might assume that the untrained subjects would rely more on intuitions and the trained subjects on rules, but it is just as likely to be the other way round.)¹⁴⁹ A few of the undoubted difficulties in knowing what it is that one is measuring here are outlined in a paper by Marcos Nadal and colleagues.¹⁵⁰

What's more, the sexes differ in their brain responses (see below), and there are, for either sex, differences between early (~300 milliseconds) and late (~600 milliseconds) responses. Jacobsen and Höfel have put forward a two-stage model of aesthetic preference.¹⁵¹ During the first stage, they suggest, at around 300 milliseconds, an initial impression is formed. This is associated with midline, thus non-lateralised, frontal activity. The second stage, a deeper aesthetic evaluation, begins close to 600 milliseconds and is related to widespread right hemisphere activity.¹⁵² Thus, much may depend simply on timing in any experimental setting: this is virtually impossible to assess using fMRI which has only gross time resolution – a few seconds at best – though it is possible using EEG.

And then there's the fact that as people age and get more experienced, they acquire quirkier kinds of preferences. Furthermore, different aspects of the same hemisphere seem to be involved with different qualities involved in the object of appreciation. One study compared popular music with 'artistic' (so-called classical) music: 'activation of right putamen tracked the aesthetic ratings of popular music, whereas the right medial prefrontal cortex tracked the aesthetic ratings of artistic music ... artistic music activated theory of mind areas ... when compared with popular music. And these areas also tracked aesthetic ratings of artistic music but not those of popular music.' 'Artistic' music, the authors conclude, involves intelligence and social cognition to a greater extent than popular music.¹⁵³

Given all of that, it would be a minor miracle if there was consistency. There can be no one circumscribed ‘beauty centre’: too much is going on. As David Bentley Hart points out,

Beauty is something other than the visible or audible or conceptual agreement of parts, and the experience of beauty can never be wholly reduced to any set of material constituents. It is something mysterious, prodigal, often unanticipated, even capricious. We can find ourselves suddenly amazed by some strange and indefinable glory in a barren field, an urban ruin, the splendid disarray of a storm-wracked forest ... [154](#)

The situation looks unpromising. As one paper puts it, ‘rational reductionist approaches to the neural basis for beauty ... may well distil out the very thing one wants to understand’. [155](#)

Readers by now will not be surprised to learn that our receptiveness to and appreciation of the aesthetic is, with all such caveats, highly dependent on the right hemisphere. Not everyone would necessarily accept such an assessment, so readers interested in following the evidence can read it in an appendix and reach their own conclusions (Appendix 6). Suffice it to say here that lesion studies, where alone one has naturalistic accounts of subjects describing, specifically, a loss of the sense of beauty, are almost conclusive (92%) in favour of the right hemisphere as the locus of beauty appreciation; studies of appreciation in normal subjects confirm this tendency; and even studies of explicit *linguistic* judgment of an aesthetic nature, despite a built-in tendency favouring the left hemisphere, offer broad support. Given the aforementioned complexities involved in designing studies in normal subjects, this degree of cohesion is highly significant. As if to confirm the picture, it turns out that the intact brain as a whole has ‘aesthetic preferences that are very close to the ones of the right hemisphere’. [156](#)

There is reason, I suggest, to believe that beauty is neither ‘surplus’ to what matters in the cosmos, nor a human invention: it would appear to be, rather, a constitutive element in the cosmos to which the right hemisphere is particularly attuned, an aspect of reality which it discloses. If that were the case, and given that I have throughout this book presented evidence that the

right hemisphere is a more reliable guide to the nature of things than the left, we would expect that beauty had qualities that could neither be reduced to utility, nor were conformable to the assumptions of the left hemisphere's model of reality. I have already alluded to some of these qualities: beauty's relational nature; its affinity for the ambiguous and unexpected; its implicit and embodied nature; its dependence on appreciation of the unique; its *Gestalt* nature; its capacity to please without concepts, its close link with the imagination, and its intrinsic ineffability.

But there are further attributes of beauty that strongly suggest it is an insight into the deep nature of the cosmos, not just a mental construct. On first principles, we would expect a preference for the perfect over the imperfect, and the symmetrical over the asymmetrical. (Certainly this would be the case if beauty was *just* an aid to mate selection.) What we find, though, is that beauty often attends a coupling of symmetry with asymmetry, of perfection with imperfection: and that these couplings are themselves asymmetrical, as in the case of the brain hemispheres, one element being capable of incorporating its opposite, while the other cannot.

Let us take again the example of the golden ratio, also known as *phi* (ϕ), which I mentioned in Chapters 15 & 24, where I referred to the way in which it incorporates asymmetry in its symmetry. Its value is approximately 1.618. It occurs in the structures of the Ancient Egyptians,¹⁵⁷ and is thought to have been known to the Greeks and Romans, as well as being present in Eastern cultures, such as those of the Japanese, Chinese and Indian civilisations, who also recognised the Fibonacci series to which it is related.¹⁵⁸

The role of ϕ in aesthetics is not, however, undisputed. Though Leonardo knew it as 'the divine proportion', and undoubtedly painters, architects and designers have used and continue to use it as a reference point for beautiful proportion for centuries, it has been the target of recent, predictable, 'debunking', probably because it is often known as 'divine', appears to be threaded through nature in ways we cannot fully fathom, and might suggest intrinsic beauty and order in the cosmos (all red rags to the Nothing Buttery bull). There is a serious point to be made on behalf of such exercises: namely, that if you do enough comparisons of measurements you are likely to come up with an approximation to ϕ *somewhere*. That may be true, but it ignores the evidence that, for example, in many beautiful faces ϕ can be found in around 10 places, but rarely in less beautiful faces.¹⁵⁹

Questioning it is entirely legitimate, but for critics to be taken seriously they'd need something that passes for a logical argument, not just, a grumpy assertion that 'it's bullshit', in the words of one hapless 'debunker'.¹⁶⁰

The aspiring debunker's arguments are not impressive. For example, ϕ , it is objected, is, like π , an irrational number, the full expression of which has an infinite number of digits after the decimal point: ergo, it cannot exist in the real world. Clearly this can carry no weight: we don't dispute the existence or usefulness in the real world of π on these grounds. Moreover, in the real world no-one could possibly appreciate the difference made by a few extra million decimal places of accuracy. Then, it is said, only approximations to ϕ tend to show up in the real world. See previous. But repeated measurements come out so close as to make mere dismissal look embarrassingly simple-minded. To take an example: the classic ϕ ratio in the human body (that between overall height and the distance of navel from the ground) observed by Leonardo's contemporaries comes out in populations of Germans, Indians and Italians as astonishingly close to 1.618 to three decimal places.¹⁶¹

It is claimed that, if there is no evidence that artist X spoke about ϕ , this must mean it would be wrong to find it in X's work. Clearly, however, (1) that we have no record of the artist speaking about it doesn't mean he didn't speak about it, especially if we are talking of hundreds of years ago; (2) not speaking about it doesn't mean he didn't know about it; but (3) why must he have known about it in order to use it in his work? Why should only explicit use count as use? While many cases of the use of ϕ are deliberate, many cases in art and architecture are equally likely to be intuitive rather than calculated. But this does nothing to rob them of interest or discredit them: rather the opposite, since it seems that artists find the golden section by intuition, not merely by following a formula. One ardent debunker, Keith Devlin, dismisses averages that converge on ϕ , as though only single cases count. He puts up straw-man arguments, such as that ϕ is claimed (by whom?) to be all that matters in assessing beauty, or that it must always be present in all instances of beauty, or that it can be used as a 'diagnostic test' for beauty. He exhibits grotesque distortions of known faces, claiming that they are the result of applying ϕ ; but this is so silly, and so far from any attempt to engage with the issue in good faith, that one is pushed to find a charitable explanation, other than that he assumes his audience is stupid. For a far more balanced assessment, that acknowledges pitfalls, and

presents well-sourced evidence, I suggest an overview that took 20 years in the making, and is continually updated online, by Gary Meisner.¹⁶²

The brain correlates of the appreciation of the golden ratio have not been widely researched. Two studies now show that the ‘two key regions’ that respond to ‘the canonical (ϕ) proportion’ are both in the right hemisphere – the right occipitotemporal and right parietal areas. When sculptures exhibiting the golden ratio were presented, these areas repeatedly responded, but when the proportions of the sculptures were subtly altered they did not.¹⁶³ It has separately been reported that the right hemisphere is attracted to figures drawn according to the golden ratio, as well as to relatively square shapes, while the left hemisphere seems to be more attracted by shapes that are tall and narrow.¹⁶⁴ (Perhaps not coincidentally, this corresponds to the shape of most modern urban buildings.)

Beauty is closely linked to balance and harmony. In turn the presence or absence, or subtle variation, of symmetry affects our assessment of beauty.¹⁶⁵ Symmetry perception requires global processing, so might on first principles be expected to engage the right hemisphere preferentially. And, indeed, the assessment of symmetry or asymmetry is specifically right hemisphere-dependent – ‘a cognitive function lateralized to the right hemisphere for most of the population’.¹⁶⁶ This is also the case in blind people for tactile symmetry.¹⁶⁷ Strikingly, a patient with occipital and only mild right parietal damage had normal spatial attention, but no ability to discriminate symmetry.¹⁶⁸

Symmetry is independent of beauty, though it often plays a covert, if not overt, role. As I have pointed out, asymmetry depends on the underlying possibility of symmetry, and registers the tension between its absence and potential presence. Japanese art has long exalted asymmetry and imperfection in art,¹⁶⁹ an ideal that is intimately linked to the philosophy of Zen Buddhism.¹⁷⁰ It also idealises incompleteness and brokenness, both of which suggest something in process, not finished, as well as austerity and modesty. Importantly this imperfection is said to arouse a sense of serene melancholy and a spiritual longing in the one who sees it (not mere pleasure or comfort): in this it seems to me very like most great music.¹⁷¹ This is the principle behind the most important concept in Japanese aesthetics, that of *wabi-sabi*, that beauty is transient, that imperfections connect us with nature and the work of the maker, that what is empty is richer than what is full.

There is an art form called *kintsugi* (or *kintsukuroi*), in which broken objects are repaired with lacquer, sometimes gold, in a way that draws attention to the flaws, rather than attempting to hide them. The results are sometimes ravishing (see Plate 22[c]).

According to Robert Wicks, ‘traditional Japanese aesthetics is an aesthetics of imperfection, insufficiency, incompleteness, asymmetry, and irregularity.’¹⁷² Note these qualities also distinguish the beauty of natural processes from the beauty of mechanical artefacts. Compare this observation from English composer Julian Marshall on the sublime and its beauty:

it’s usually writings where ‘brokenness’ is a feature where, for me, beauty shows up. In other words I rarely find a ‘one way’ ticket to the sublime does it – that’s like a quick fix. It’s where there is a journey through something incomplete that puts me in touch with a deeper, truer experience of beauty...¹⁷³

Nor is symmetry necessary to beauty in the living. A number of studies have found facial attractiveness to be unrelated to symmetry;¹⁷⁴ and some have found that asymmetry is actually preferred.¹⁷⁵ Symmetry runs the risk of looking uncanny and mechanical. However, the exact relationship between beauty and symmetry in the human face is still open to debate.¹⁷⁶

There is something just a little grandiose about symmetry: it speaks of perfection, complete control, something finished and outside of time – and hence outside of life. ‘Even heaven is not complete’.

So far we have talked of where symmetry/asymmetry is *assessed*, but not of where it is *preferred*. Symmetry is better assessed, but not necessarily better preferred, by the right hemisphere. One interesting finding is that symmetry is more *favourably* assessed in the centre of the field than in peripheral vision: this is the part of the visual field in which left hemisphere attention is concentrated.¹⁷⁷ People with conditions that are associated with right hemisphere deficits, such as schizophrenia, autism and anorexia nervosa, have an unusual predilection for, at least simple, symmetry. It was also, of course, the hallmark of the movement known, with appropriate *hubris*, as the Enlightenment. Compare these two images (Plates 23[a] & [b]), one of a Renaissance façade by Palladio, the other of an Enlightenment

façade by Jefferson, both beautiful in their way, both probably ultimately derived from the Roman Pantheon.

Extremely prominent in the Palladian façade are elements of life that are clearly asymmetrical: in the statues, in the central plaque, and in the ‘balancing’ (itself asymmetrical) of male and female forms. These set up a wonderful counterpoint with the symmetry of the core. By comparison the Jefferson building seems somewhat adynamic and devitalised, though undoubtedly pleasing, in its perfect symmetry, up to a point. It is appropriate that a clock, a device that spatialises and measures time, occupies the central position in the pediment; in Palladio’s façade it is an (asymmetrical) crest depicting an animal.¹⁷⁸

Symmetry is about relations between parts, but asymmetry is about the relations between symmetry and its absence, something still deeper. This relationship between a thing and its absence is central to Japanese aesthetics – and not to Japanese aesthetics alone. In his classic work, *In Praise of Shadows*, Jun’ichiro Tanizaki writes:

We find beauty not in the thing itself but in the patterns of shadows, the light and the darkness, that one thing against another creates ... Were it not for shadows, there would be no beauty ... I would call back at least for literature this world of shadows we are losing. In the mansion called literature I would have the eaves deep and the walls dark, I would push back into the shadows the things that come forward too clearly ...¹⁷⁹

Beauty is, Tanizaki suggests, resistant to the bright beam of the intellect’s spotlight: bright light can kill beauty, as photographers and painters well understand. And beauty depends on contrast. If everything attracts us equally, nothing in particular attracts us. As Ruskin says:

beauty deprived of its proper foils and adjuncts ceases to be enjoyed as beauty, just as light deprived of all shadow ceases to be enjoyed as light. A white canvas cannot produce an effect of sunshine; the painter must darken it in some places before he can make it look luminous in others ...¹⁸⁰

The very existence of beauty, goodness and truth requires that some things be more beautiful, better, and truer, than others; they depend for their existence on their dipolar nature. Theologian Hans Urs von Balthasar wrote:

Since the beautiful comprises both tension and its release, and reconciliation of opposites by their interaction, it extends beyond its own domain and necessarily postulates its own opposite as a foil. The sublime has to be set off by the base, the noble by the comic and grotesque, even by the ugly and the horrible, so that the beautiful may have its due place in the whole, and that a heightened value may accrue from its presence.¹⁸¹

The most beautiful hymn in praise of erotic love in modern times – perhaps ever – Strauss’s *Der Rosenkavalier*, depends, to some extent, on the vulgar crassness of Baron Ochs, much as Shakespeare’s tragedies require their burlesque scenes.

The beautiful is not the same as the sublime,¹⁸² yet it is closer than it has often been made out to be. The essential element in the sublime is not merely something large, but something whose limits, like a mountain top that is lost in cloud, are unknown: it is both there and not there, never fully knowable, and more vital for not being subject to pinning down. It is what aesthetician Patrick Colm Hogan calls ‘targeted absence’, by which he means the use of vagueness or ellipsis to foster aesthetic response, by invoking ‘the interrelation of presence and absence’.¹⁸³ Elsewhere he comments on both sublimity and beauty:

Specifically, the emotions at issue in feelings of beauty and sublimity appear to be primarily attachment, on the one hand, and a profound sense of isolation, on the other ...¹⁸⁴

This highly creative bringing together of distance and union, of negation with affirmation, of absence with presence, has, of course, been a theme of this book. The only neuroscientific study to date to have examined specifically the sublime, as distinct from the beautiful, found, as one might expect, that the two areas of cerebral cortex specifically involved were in the right hemisphere: the right caudate and right putamen, both areas we

have come across before in relation to the beautiful.¹⁸⁵ The emotion associated with the sublime is awe, which is effectively what Rilke had in mind in his account of beauty that I quoted – another reason to consider any sharp distinction artificial.

I stressed earlier that I was not suggesting that the beautiful colours of the flowers and birds, and all the other beauties of nature, were created by an engineering God for human delight. Rather it seems to me that we, as they, are the manifestations of an intrinsically beautiful cosmos, and to borrow again Deutsch's formulation, this explains why everywhere we go 'the inhabitants come up and speak to us in English'. Beauty is our native tongue.

It is suggestive that changes of behaviour are, according to American neuroscientist Bud Craig,

actually initiated by activity in the right anterior insula, followed by the anterior cingulate, rather than the cingulate initiating behavior.¹⁸⁶ Other functional imaging studies of 'free won't' or error awareness suggest that the left anterior insula is predominantly involved in monitoring, rather than generating, behaviours.¹⁸⁷

Craig refers to 'this complementary pairing – the right side leading and the left side following'.¹⁸⁸ I say 'suggestive', because three important roles of the right, specifically anterior, insula that have emerged are: appreciation of beauty, emotional understanding, and initiating a change of behaviour.¹⁸⁹ By beauty we are moved to move.



Of the two claims outlined towards the beginning of this chapter, one is susceptible of proof and the other isn't.

Claims concerning the role of the right hemisphere in the disclosing of value can be put to the test. They are not claims of an 'all or nothing' kind – no claims about human life can be; but I believe the evidence suggests that these particular claims are very likely to be correct.

However, the main claim is not of this kind. It concerns how we understand ourselves, the world and our relation to it. The prevailing dominant account of a meaningless, purely material cosmos, supplied by the reductionist strategy of the left hemisphere, fails to make sense of value, whether that be truth, goodness or beauty, just as it fails to make sense of consciousness. Its answer in every case is the same: that they must be emanations of that purely material cosmos – emanations of matter – that exist purely to further utility. It seems to me that, if you believe that, you will believe anything; you might even end up believing that consciousness is an illusion.

Neither this point of view nor any alternative to it can be proved, so our best recourse is to apply science, reason, intuition and imagination to experience. It seems to me that the reductionist account is contrary to scientific findings, unreasonable, counterintuitive, and shows a complete refusal to exercise intelligent imagination: all the hallmarks of its birth in the left hemisphere. The result is that values themselves become devalued. Beauty, morality and truth have been downgraded, dismissed or denied. If you want to see the consequences, you need do no more than look around you.

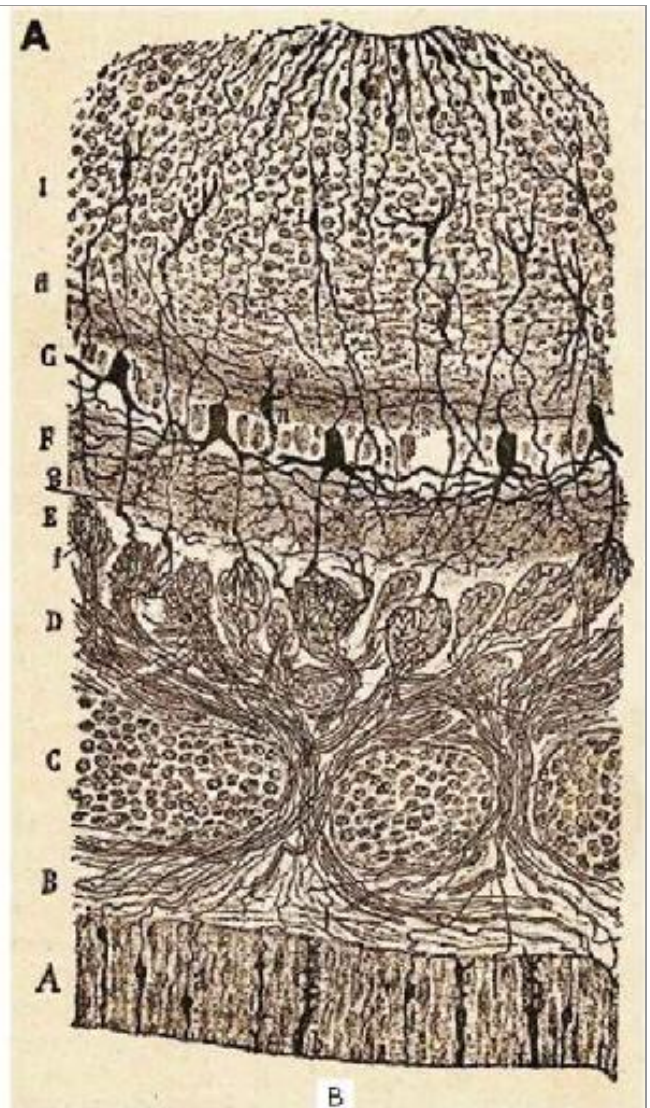


Plate 17[a] · Olfactory bulb of a dog, drawing by Camillo Golgi, 1875 (Golgi 1875)
 Plate 17[b] · Olfactory bulb of a mouse, drawing by Santiago Ramón y Cajal, 1890
 (Ramón y Cajal 1890) Camillo Golgi and Santiago Ramón y Cajal, the two most
 eminent neuropathologists of the nineteenth century, saw the same need for
 simultaneous differentiation and union within the central nervous system, but
 differed over how this was achieved. See Chapter 21.



Plate 18 · Studies of Water Passing Obstacles and Falling, by Leonardo da Vinci, ink and black chalk on paper, c 1510–13. See Chapter 23.



Plate 19[a] · Seated Old Man, and Studies and Notes on the Movement of Water, by Leonardo da Vinci, ink on paper c 1510. See Chapter 23.

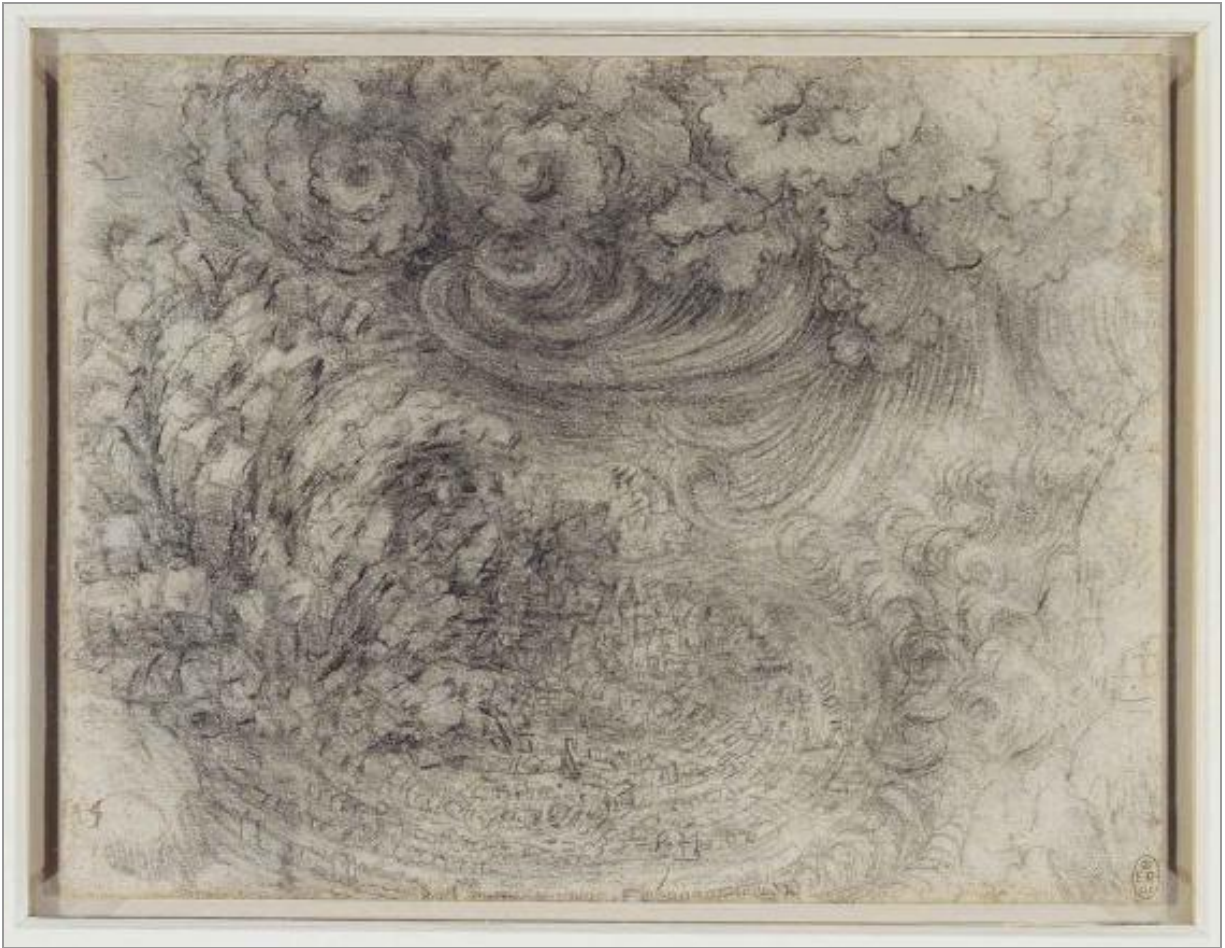


Plate 19[b] · Deluge, by Leonardo da Vinci, black chalk on paper, c 1517–18. See Chapter 23.



Plate 20 The Great Wave off Kanagawa, by Katsushika Hokusai, woodblock print, 1831 Both wave and crystal forms of water are individually entirely unique and unpredictable, yet are in no sense disorderly or chaotic, but fractal and lawful in their morphology. See Chapter 23.

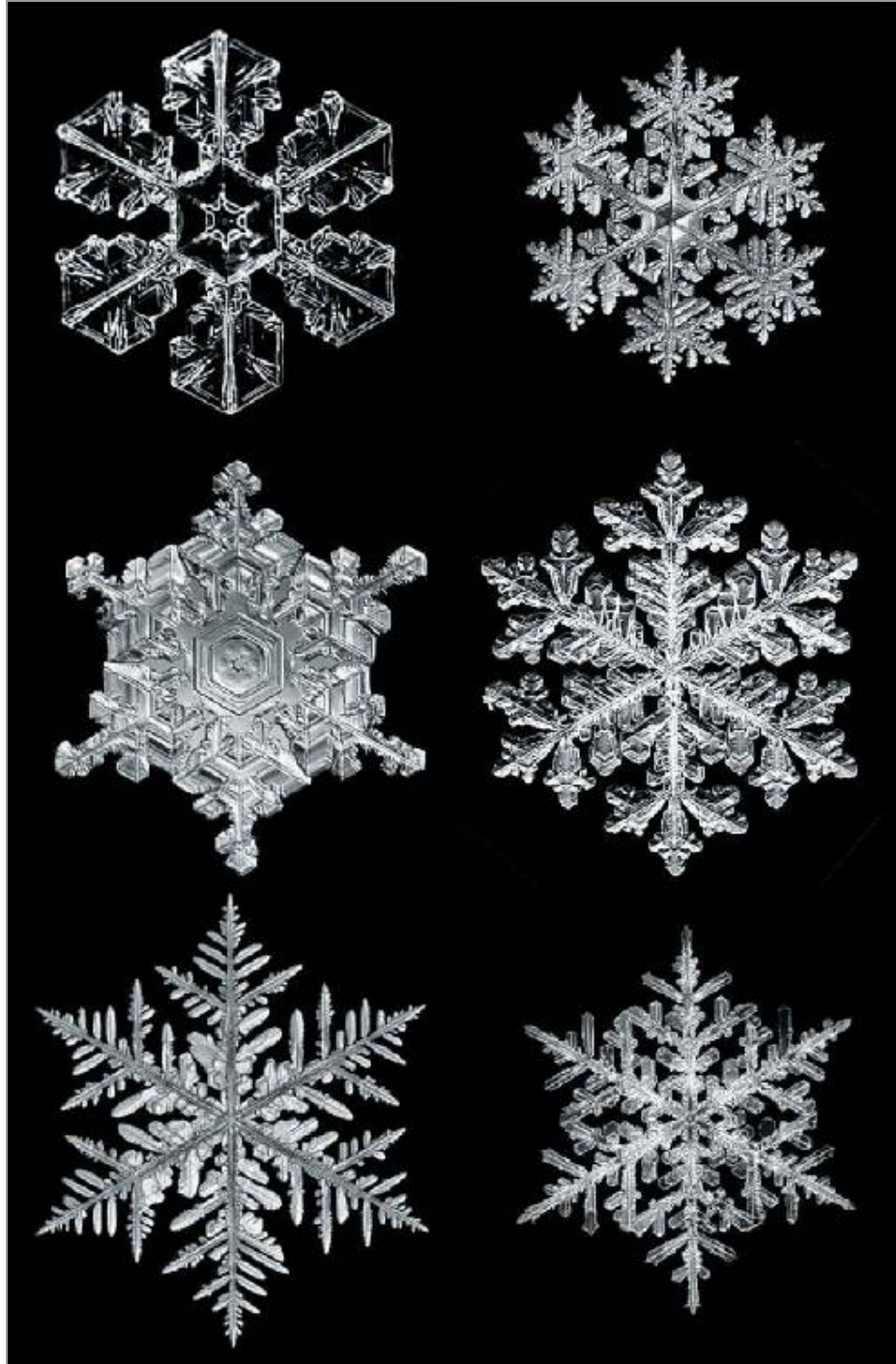


Plate 21: Diversity of lawful architectve structure in snowflakes See Chapters 20 and 23.



Plate 22[a] · Bi-stable image of woman's face and flower. See Chapter 22.

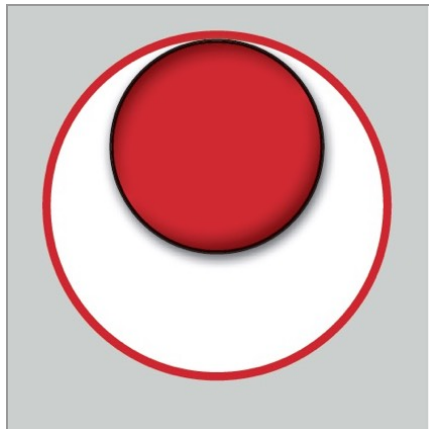


Plate 22[b] · Inyo symbol. See Chapter 24.



Plate 22[c] · Wabi-sabi / kintsugi ware. See Chapter 26.

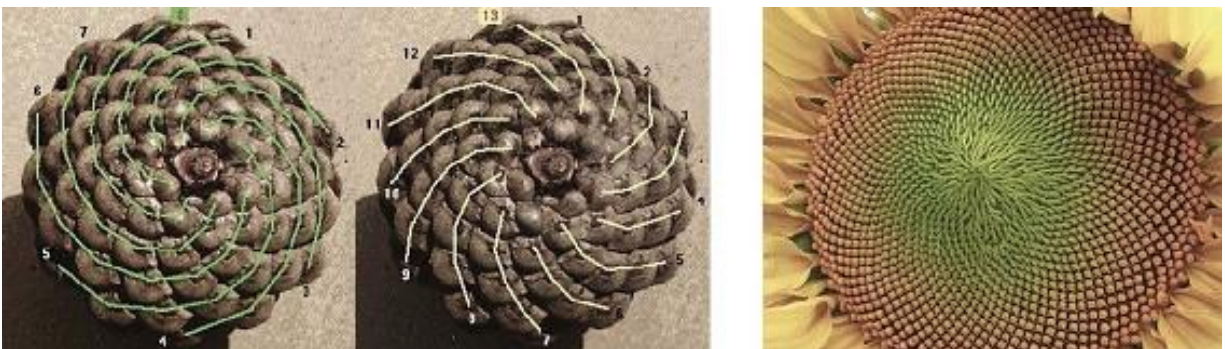


Plate 22[d] & [e] · Fibonacci series in pine cones and sunflower. See Chapter 24.



Plate 23[a] · Façade of the Villa Capra ('La Rotonda'), near Vicenza, designed by Andrea Palladio in 1570, finished 1592. See Chapter 26.



Plate 23[b] · Façade of The Rotonda, University of Virginia, designed by Thomas Jefferson, completed 1826. See Chapter 26.

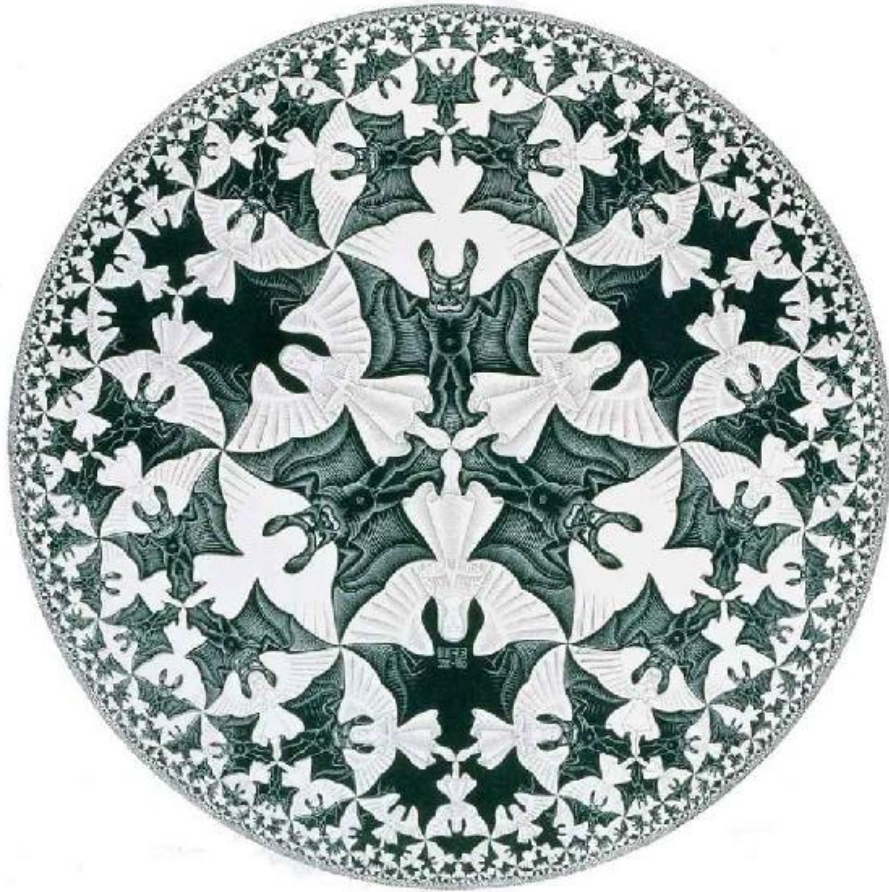


Plate 24 · Circle Limit IV (also known as 'Heaven or Hell', or 'Angels and Devils'), by M. C. Escher, engraving, 1960. 'If only you knew the things I have seen in the darkness of night', remarked Escher (Ernst 2007: 20). Many of Escher's drawings involve being able to reverse figure and ground. The left hemisphere tends to focus on what stands out against the ground at the expense of the ground itself; the right hemisphere is better able to see both. The flexibility of view that Escher's drawings demand tends to rely on right hemisphere perceptual capacity (as with so-called 'bi-stable percepts'). See Chapter 28.

PURPOSE, LIFE AND THE NATURE OF THE COSMOS

Not every end is the goal. The end of a melody is not its goal, and yet if a melody has not reached its end, it has not reached its goal. A parable.

—*Friedrich Nietzsche*¹

The teleology of the universe is directed to the production of beauty.

—*Alfred North Whitehead*²

NIETZSCHE'S 'PARABLE' POINTS UP A NUMBER OF WAYS IN WHICH WE CAN talk at cross-purposes about purpose: I will explore a few in what follows. It's an important topic – that of purpose – because it is close to the whole question of the meaning or meaninglessness of life. The point is not that there should be a readily expressible answer to the purpose of life, or the cosmos, and we'd better set out to pin down what it is: that would be to mistake the nature of such a purpose. It is perfectly coherent to discern a purposefulness in what one sees without being able to delimit in language (outside perhaps of poetry) what that purpose 'is', especially if that purpose is not purely instrumental. John Dewey thought the 'deepest problem of modern life' is that we have failed to integrate our beliefs about the world with our beliefs about value and purpose.³ One of the reasons is that nowadays we ask science to answer questions it is not equipped to answer, and its answer to the question whether there is purpose in the world is a

resounding ‘no’ – which is hardly surprising, since it excludes purpose from its considerations from the outset.

It is also much easier to ignore purpose if, in accordance with the left hemisphere’s dictates, we focus on detail to the exclusion of the whole picture. Narrow views, which are intrinsic to molecular biology, encourage focus on local mechanisms and effectively would not be in a position to perceive purpose if there was one. They provide a description which, while appearing complete in its own terms, misses crucial insights which are hard to accommodate in its model. But naturally that cannot be a reason to ignore them; indeed, for that very reason they must not be ignored.

WHAT IS PURPOSE?

Purpose means different things; and it is a matter of observation – and hardly likely to be a coincidence – that those differences accord with two differing dispositions towards the world that the reader will by now recognise.

The first difference is whether purpose is thought of as being extrinsic and instrumental – eg, the purpose of a photocopier lying in the copied sheet that emerges from it – or, on the contrary, intrinsic and entirely fulfilled in the process itself – as might be a dance, or a poem: by no means pointless, but the point lying within, not like the copied sheet, without, the process that brought it into being.

The second difference is that between a narrowly determined and mechanistic account of purpose, on the one hand, and a largely undetermined and free account, on the other.

The third is a matter of scale: the difference between a narrowly localised and a broad, overarching view of purpose.

These three distinctions map, in the same order, onto each other: extrinsic, deterministic and narrowly focussed according to one view; intrinsic, free and attending to the broad *Gestalt* according to the other.

NON-INSTRUMENTALITY

To deal with the first: a machine has an extrinsic purpose – not its own, but that of the person who made it. It exists purely to achieve an end: another being's end. By contrast, a melody has an intrinsic purpose: it's hardly pointless, but it has no other point than itself. This is the distinction made by James Carse between finite games that come to an end when their goal is achieved, and infinite games that do not issue in an 'outcome' – or do so only incidentally.

Everything of ultimate importance forms part of what George Steiner referred to, in a wonderful phrase, as 'the sovereignly useless'.⁴ Such things have intrinsic purpose: trying to find an extrinsic purpose fails and, in the process, devalues them: it feels like a betrayal. Gifts and selfless actions are obvious examples; but celebrations, music, art, poetry, drama, liturgy, meditation, philosophy, spirituality, leading a good life, or ultimately just being the human being you are, are all examples. These are not pointless – about as far as one can get from that; but seeing them as purposed to anyone's gain, whether yours or another's, destroys the essence for which they are prized. They become instrumentalised. Here one sees the first and most obvious hemispheric distinction: that between a strategic purpose, as the left hemisphere sees it, designed to issue in utility; and purpose as the celebration of life, creativity, difference and uniqueness, as the right hemisphere takes it to be.

This takes us back to the discussion of beauty, and my emphasis on the inadequacy of utility as providing even a start on its essential nature. Beauty is gloriously superfluous and unnecessary: its nature is that of a gift. Hart writes that beauty

is not simply this or that aspect of its composition, not simply its neurological effect, not simply its clarity or vividness or suggestive associations, and so on; it is not even just the virtuosity of its execution or the mastery exhibited in its composition. Rather, it is all of these things experienced as sheer fortuity. I may be speaking of something that escapes exact definition here, but it seems clear to me that the special delight experienced in the encounter with beauty

is an immediate sense of the utterly unnecessary thereness, so to speak, of a thing, the simple gratuity with which it shows itself, or (better) gives itself. Apart from this, even the most perfectly executed work of art would be only a display of artisanal proficiency or of pure technique, exciting our admiration but not that strange rapture that marks the most intense of aesthetic experiences. What transforms the merely accomplished into the revelatory is this invisible nimbus of utter gratuity ... the beautiful presents itself to us as an entirely unwarranted, unnecessary, and yet marvellously fitting gift.⁵

The machine fulfils an extrinsic purpose only after abandoning its stable state, that of something naturally static. A single cell, by contrast, has no extrinsic purpose, but nonetheless is extremely active in pursuing its intrinsic purpose, its own continuance and development, ie, the persistence of its stable state as something that is naturally flowing. Even as part of a multicellular organism its purpose continues to be intrinsic, though not, unless something is badly wrong, at the *expense* of the organism as a whole, but in harmony with the organism – not doing so is what makes cancer cells so very unusual. (In some important cases, such as occur in the immune system, the cell's own purposes are actually subordinated to that of the organism – self-sacrificial cells: I will come to that later.) There is an alignment of aims, as a citizen in a properly functioning society is not just a tool of that society, but flourishes in it, while contributing to the flourishing of society as a whole.⁶

Most discussions of purpose in life or the cosmos founder on this distinction. If you understand purpose to mean extrinsic purpose, you invent an engineering God who made the universe as an infinitely complex mechanism to serve some unknown end of his own. Such a God is just a projection of the left hemisphere's fantasy of endless power to manipulate – a divine left hemisphere, detached from the cosmos and running the show according to a foreordained plan. Such a God belongs in a mechanical universe, a museum of clockwork, and that is the last thing we are dealing with. If, like me, you can't, understandably, believe in such a God, you might jump to the conclusion that this infinitely complex 'mechanism' has simply no purpose. But that is just to make the same error, that of

conceiving purpose only in extrinsic terms: as if the only alternatives were the purposes of an engineering God, or a cosmos without purpose.

OPENNESS

The second difference is this: between a purpose that is closed down to a predetermined mechanism and one that is free and largely undetermined. ‘The success of Darwinian natural selection’, wrote Popper,

in showing that the *purpose or end* which an organ like the eye seems to serve may be only apparent has been misinterpreted as the nihilist doctrine that all purpose is only apparent purpose, and that there cannot be any end or purpose or meaning or task in our life.⁷

To some extent this is an extension of the previous distinction, since there will usually be a predetermined mechanism only where there is a clear extrinsic purpose: back to engineering. But that is not because there *could* not, in principle, be a detailed plan of, eg, how to write a poem, or how to lead a good life – there could: it’s just that it would be worth rather little. We recognise that such detail is inimical to achieving the valued end. A degree of *freedom* necessary to the process would have to be sacrificed; and having too prescriptive a plan will prevent one achieving the end at all. The poem becomes doggerel; the good life Pharisaic.

Thus pursuing non-mechanical purposes, bearing in mind something one values and wants to bring about, requires a sense of direction, yes – but a necessary, patient, withdrawal from control over the detail. The process must be *flexible*. As James says, where the undetermined plays a part, ‘the system of other things has no positive hold on the chance-thing ... [it] says hands off! coming, when it comes, as a free gift, or not at all.’ Note that here again, the nature of a gift is invoked.

Here, then, is the second hemispheric distinction: between what is controlled, rigid, with focus on detail, and what is flexibly responded to, with appreciation of the bigger picture. The purpose is overarching, not contained in the detail. A deterministic finalism is just the flipside of mechanism. A controlling God whose creatures are the tools of his purpose; the biological determinism of ‘robot vehicles blindly programmed to preserve the selfish molecules known as genes’; and the Laplacian determinism of the cosmic billiard table; all come from the same place.

William Paley, the eighteenth-century cleric and philosopher, was, after all, a utilitarian. That left hemisphere mindset is clear from his tell-tale model: that the universe is a mechanism, like a watch; and a watch needs a watchmaker.⁸ As mentioned, Dawkins says that ‘people like me might be labelled neo-Paleyists, or perhaps “transformed Paleyists”’: Paleyists without God, still believers in a watchmaker, though blind.⁹

SCALE

And third, the matter of scale. Scale matters far more than is often realised, especially by those who have a mechanistic or reductionist outlook. We have seen examples of what is predictable at the local level being ultimately unpredictable at a higher level (collisions of billiard balls); and examples of the reverse, what is unpredictable at the local level being predictable at a higher level (numbers of dog bites). Purposes are equally dependent on scale. A creature with a purpose can belong to a whole that has none, or vice versa. That a creature has local ‘purposes’ is a separate issue from whether it has a purpose. Thus a lioness hunts with a purpose – a local and instrumental purpose, lunch – which is not to say that hunting is her greater purpose, or even that she has an overall purpose at all (though I think she has one). That Y is the effect of cause X does not make Y the purpose of the whole in which the cause and effect chain operate. Copulation results in the propagation of genes, without that necessarily being the purpose of the whole in which this cause and effect chain operates: life. Turning the engine of a Nazi staff car makes the car capable of motion, but that cannot be assumed to be therefore the purpose of the whole event in which this particular cause and effect chain operates. There’s far more to both than meets the myopic eye. On this, again Andrew Steane is good:

Perhaps the purpose of a lioness is to dissipate entropy as quickly as possible (I doubt it). Perhaps the purpose of a lioness is to produce more lioness genes (I doubt it). Perhaps the purpose of a lioness is to kill, eat, and copulate (I doubt that, too). Perhaps the purpose of a lioness is to be a lioness (this seems to me to be on the right track). Perhaps the purpose of a lioness is to express whatever good a lioness is capable of expressing (I am inclined to pick this one). Perhaps the purpose of a lioness is to express an aspect of what the verb *to be* can signify.¹⁰

I’d be inclined to pick the last one, ultimately. Everything that exists could be seen as an unfolding of the potential within being, and a re-folding of it again into a now enriched whole. At the local level there are

only what look like *extrinsic* purposes. At a larger level one sees a picture that modifies the value and purpose of the detail. And at the global level one sees *intrinsic* purposes; purposive goings-out to meet the world, guided by attractors, but not to achieve utility. They are gloriously, magnificently, sovereignly useless. This is like the mother's relationship to her children – or, if she is an artist, to her creation. There are no blue-prints: there is a clear tendency or purpose towards creation in this universe, but one of a flexible and completely non-instrumental kind.

In Chapter 12, I showed that a complex system that is intrinsically unpredictable can nonetheless contain short linear chains that are very largely predictable. Kolakowski, expanding on Bergson, writes: 'The mechanistic view is applicable to some fragments which we artificially cut out from the world for practical purposes: it can be applied neither to the universe as a whole nor to the phenomenon of life.'¹¹

I would suggest that whatever creative energy underwrites the unfolding of the phenomenal universe is continually active and involved in that universe; that the future is tended towards, but not closely determined; rather it is open, evolving, self-fulfilling. This means that it seems 'purposeless' to some; richly 'purposeful' to others. To me, a universe with tendencies towards beauty, complexity, and the rich unfolding of uniqueness is already teleological. It is a verb with many adverbs, not just a matter of nouns chasing nouns.

Though purpose may be more or less apparent at different levels, the process of life cannot, in reality, be broken down in this way. This is because the purposes of an organism are shared with a group of other organisms, or with the 'environment' (which is another way of saying the same thing). Creatures are not the passive playthings of necessity, but determine their environment as much as the environment determines them.¹² The idea of a niche, separate from an animal whose niche it is, is nonsensical. The animal shapes the niche to its purposes; the niche in turn shapes the animal to its own. Every part of the world is a potential niche for something. Living beings equally shape and are shaped by a world that is coming into being alongside them in a reciprocal, and reciprocally paced, process, not negotiating a path across its already pre-formed surface.¹³ The environment of the rain forest has accommodated the most staggering, teeming variety of creatures of every conceivable kind, not just one 'solution to rain-forest living' that works best. All creatures and their

environment together are interdependent. Interdependence means not just interaction, but mutual constitution. In keeping with this free model of evolution, both Peirce and Whitehead, as well as, among others, the physicists Paul Dirac, John Archibald Wheeler and Richard Feynman, preferred the idea of habits in Nature, that themselves evolve, to the idea of universal laws.^{[14](#)}

DARWIN AND PURPOSE

Darwin is often thought to have done away with purpose. Brought up to believe not only in an engineering God but in one who was benevolent, too, Darwin was genuinely and appropriately troubled by his observation of cruelty in nature, just as he was genuinely and appropriately awestruck by his observation of nature's beauty. He did not exclude that there was what he called 'design' (purpose) at a higher level, while the lower level remained unplanned. In a famous passage from a letter to Asa Gray, the most important American botanist of the nineteenth century, he wrote:

I cannot persuade myself that a beneficent & omnipotent God would have designedly created the *Ichneumonidæ* with the express intention of their feeding within the living bodies of caterpillars, or that a cat should play with mice. Not believing this, I see no necessity in the belief that the eye was expressly designed. On the other hand I cannot anyhow be contented to view this wonderful universe & especially the nature of man, & to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance.¹⁵

When Gray reviewed Darwin's legacy for *Nature*, in June 1874, he wrote: 'Let us recognise Darwin's great service to Natural Science in bringing back to it Teleology; so that, instead of having Morphology *versus* Teleology, we shall have Morphology wedded to Teleology.'¹⁶ Darwin replied: 'What you say about teleology pleases me especially, and I do not think anyone else has ever noticed the point. I have always said that you were the man to hit the nail on the head.'¹⁷ (Much earlier, in a letter to Jeffries Wyman, Professor of Anatomy at Harvard, Darwin had written: 'No one other person understands me so thoroughly as Asa Gray. If ever I doubt what I mean myself, I think I shall ask him!').¹⁸

His son, Francis Darwin, wrote that 'one of the greatest services rendered by my father to the study of Natural History is the revival of

Teleology’;¹⁹ and the idea was corroborated by Thomas Huxley, ‘Darwin’s bulldog’:

perhaps the most remarkable service to the philosophy of Biology rendered by Mr Darwin is the reconciliation of Teleology and Morphology, and the explanation of the facts of both, which his views offer ... it is necessary to remember that there is a *wider teleology* which is not touched by the doctrine of Evolution, but is actually based upon the fundamental proposition of Evolution ... The teleological and the mechanical views of nature are not, necessarily, mutually exclusive.²⁰

A wider teleology: a broader understanding of purpose. This is an important point: there may be several factors operating at different levels. It is noticeable that those who believe in purpose rarely, if ever, deny the existence or importance of chance, or of mechanism as an almost universal causative factor at the local level; while those who believe in a mechanistic materialism rarely allow the possibility of there being purpose at any level, or anything other than mechanism involved.²¹ This may be part of the ‘either/or’ mentality that is attracted to mechanistic belief systems in the first place, and to their focus on detail.

The word ‘evolution’ – which, incidentally, appears for the first time in Darwin only in the sixth and final edition of *On the Origin of Species* – means a spinning out, an unfolding of what is latent within. As we have seen, Bergson, to whose philosophy the concept of evolution was central, points out that this can be conceived in two ways: as like the unfolding of a lady’s fan, on which the painting is fixed and the process merely brings what was already there to our eyes; or as a genuinely creative act in which what is brought ‘out’ is hitherto not just unknown but unknowable, because the evolution actually brings it into being for the first time.

It seems that Darwin’s ambivalence about purpose hinges on this difference: the first kind – limited, wholly pre-designed and finished – he cannot accept; the second – neither micro-controlled nor wholly random – he can. Writing to William Graham, the author of a book entitled *The Creed of Science*, in 1881, less than a year before he died, Darwin notes that the book was of great interest, and that, even though there were points in it with

which he could not agree, ‘nevertheless you have expressed my inward conviction, though far more vividly than I could have done, that the universe is not the result of chance.’²² And a month later, he wrote to his friend TH Farrer these words: ‘If we consider the whole universe, the mind refuses to look at it as the outcome of chance – that is, without design or purpose. The whole question seems to me insoluble’.²³ (There is a stark contrast between Darwin’s intellectual humility and the attitude of his neo-Darwinian disciples: to quote, ‘the more one thinks the more one feels the hopeless immensity of man’s ignorance’).²⁴

I would love to build a bridge to Richard Dawkins and those of his mind here: would they be willing to consider a description of Nature as something that discovers what it is in the process of becoming what it is, and the point and purpose of which lies in itself: a free, exuberant creation, not a micro-controlled one? No algorithm, no programme, no robots: just an endless self-discovering act of creation?

COMPATIBILITY OF RANDOMNESS WITH PURPOSE

It is often assumed that if events were random that would exclude the possibility of purpose; but it doesn't at all. Randomness is something purpose can work with. It introduces variation into a system: the *very stuff which purpose requires in order to act*. 'Blind stochasticity [randomness] is a misconceived idea as it has been developed in evolutionary biology', writes biologist Denis Noble:

Far from proving that evolution is necessarily blind, randomness is the clay from which higher level order can be crafted ... Organisms can and do harness stochasticity in generating function ... Randomness and functionality necessarily co-exist at different levels ... If one focusses only narrowly on the bottom end, blind chance can then seem to be the sole determinant of variation even when, in fact, the variation is directed in response to environmental challenges.²⁵

It's a matter of scale again. Noble's point was succinctly put by Popper: 'the selection may be from some repertoire of random events, without being random in its turn. This seems to me to offer a promising solution to one of our most vexing problems, and one by downward causation.'²⁶

When describing events as locally random, we are blind to intelligibility within the larger framework, much as we forget that the slightest departure from precisely equal weight, size and density in a pair of dice will spoil their ability to produce chance outcomes: randomness here, as it seems to us paradoxically, is the product of ultra-high specification.²⁷ We can have randomness only because almost everything is not random. Randomness is the limit case of order (one that is strictly speaking impossible fully to achieve); not order the limit case of randomness. Producing chance outcomes is a necessary part of the freedom in Nature's purposiveness, not a negation of it. New life is achieved by *imperfections* in transcription. Too much disorder and there is no structure for purpose to express itself in: too little disorder and there is nothing to enable purpose to express itself with.

There must be the possibility of adaptive change. Creative self-organisation implies both a degree of constraint and a degree of freedom.

At the level of the human individual, too, the fact that much is unconstrained is perfectly compatible with purpose. It doesn't have to be one or the other exclusively. For example, I can have the clear purpose to start a family, but when, where, with whom and by what means not only *might* be, but cannot help being, to a considerable degree, matters of chance. But without that purpose, I might never put myself in the way of its happening at all.

C.H. Waddington, the most interesting philosophical biologist of the last century, proposed the existence of what he called 'chreodes' (literally, 'useful roads'), possible paths of development which might be represented by a landscape of valleys, divided by ridges, which canalise streams.²⁸ If a stream flowing down a valley is diverted, it will usually return to the centre of the valley further down. A very large diversion, however, might result in the stream flowing over a ridge into a different valley. The nature and degree of the buffering is represented by the steepness and height of the ridges and the difficulty the stream would have in flowing to a different valley. The point at issue here is that, however randomly water may fall, the landscape it encounters brings about a far from random set of outcomes.

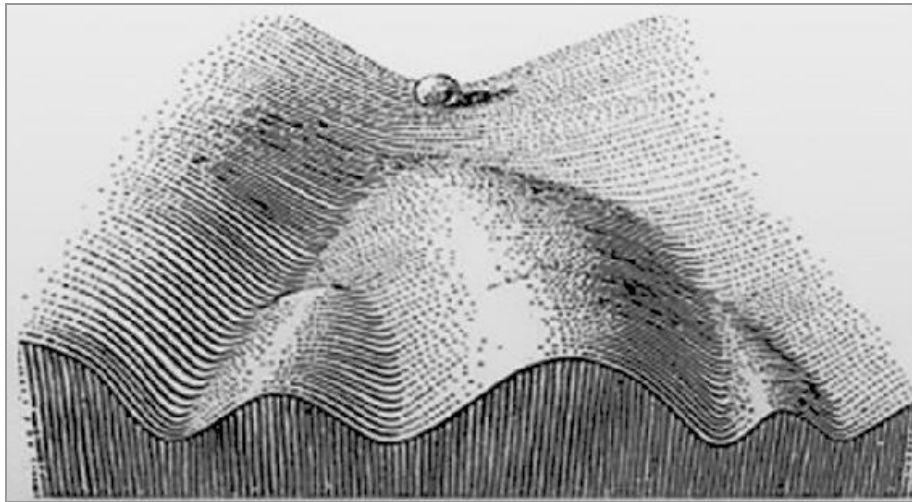


Fig. 61. Canalised pathways of change within an epigenetic landscape (after Waddington 1957)

But there is something more active involved, too. A concrete example of the necessary fruitful relation between purpose and indeterminacy comes from a cell's response to threat. Cells actively promote mutations under certain circumstances, and this process begins not from DNA, but merely uses DNA as a resource. Faced with the need for a new antigen, the mutation rate in part of the genome can be accelerated by as much as 1,000,000 times. According to Noble, 'so far as we know, the mutations occur randomly. But the location in the genome is certainly not random. The functionality in this case lies precisely in the targeting of the relevant part of the genome.'²⁹

Earlier I gave a number of examples of how organisms do not wait around for chance to save them from extinction, but both greatly accelerate, and appear to select, new mutations, so that they can recover something as complex as flagella within as little as a few days, rather than over the many millennia that chance mutation would require. We now know that even egg and sperm do not just meet randomly, but both are actively selective.³⁰

To quote Kolakowski:

The evolutionary process teems with dead ends, failures, half-baked projects, and circuitous routes; nature proceeds somewhat gropingly, often trying several roads before it finds the right one. But it is driven constantly by an inherent tendency, and to uncover this tendency would be to understand the life of the universe.³¹

PURPOSE AND LIFE

What evidence might suggest that purpose is a real element in the cosmos, at any rate in the realm of life? Is purpose intrinsic in the fabric of reality, or a happy local accident from time to time, or an invention of the human mind in order to blot out the true vacancy of life?

Before addressing the question, I'd suggest that, where two assumptions fit the data, and neither is open to proof or disproof, both may be to an extent correct (as with purpose and randomness). Certainly, in the absence of proof either way, it is just irrational to rule out the intuitively more likely assumption. That is not to claim that intuition is an infallible guide: see Chapters 17 and 18. Quite how counterintuitive and, indeed, how unlikely, sheer randomness is as a model, I will turn to next. But then science itself does not in practice behave as though the universe were a random occurrence; and 'philosophy destroys its usefulness when it indulges in brilliant feats of explaining away'.

UNADULTERATED CHANCE AS SOMEWHAT UNLIKELY

We have seen that mutations are not purely random. When it comes to the larger narrative of biology, I have already quoted Pauli writing to Bohr, to the effect that biologists use the word ‘chance’ in an irrational way.

We talked about the improbability of there being a universe which contains stars and planets in Chapter 25. The existence of life, in the absence of purposiveness – in fact, in the absence of tendencies in the cosmos to overwhelmingly unlikely ends – takes improbability to a whole new level. All life, however simple, is dependent, and as a minimum, on systems which can replicate DNA and translate it into functional proteins. These systems are vastly complex. Eugene Koonin, Senior Investigator at the National Center for Biotechnology Information, and a recognised expert in the field of evolutionary and computational biology, points to a problem here:

The origin of the translation system is, arguably, the central and the hardest problem in the study of the origin of life, and one of the hardest in all evolutionary biology. The problem has a clear catch-22 aspect: high translation fidelity hardly can be achieved without a complex, highly evolved set of RNAs and proteins but an elaborate protein machinery could not evolve without an accurate translation system.^{[32](#)}

The point here, to put it in the simplest possible terms, is that, for the evolution of life forms to get started, a certain minimum level of accurate transcription must be achieved (known as the Eigen threshold). Below this level of fidelity, there is too little stability. However, the achievement of this level of fidelity demands the evolution of a still more complex system to have been *already* achieved. This makes no sense according to our conventional schemata.

There is what Koonin calls ‘staggering complexity inherent even in the minimally functional translation system’, leading to ‘the dramatic paradox of the origin of life’:

in order to attain the minimal complexity required for a biological system to get on the Darwin-Eigen spiral, a system of a far greater complexity appears to be required. How such a system could evolve, is a puzzle that defeats conventional evolutionary thinking, all of which is about biological systems moving along the spiral ...³³

According to Koonin, despite adopting a model in which he ‘assumes a deliberately inflated rate of RNA production’, the probability that a coupled translation–replication emerges by chance in a single observable universe is $< 10^{-1018}$ – that is, less than 1 in a number expressed as 1 followed by 1,018 zeros.³⁴ Impossible to imagine; but to put it in context, the entire number of subatomic particles in the observable universe is estimated to be a mere 10^{86} – by comparison, so infinitesimally small as to be practically non-existent. Thus, effectively, if chance alone is allowed to operate, the first step on the path to life is so improbable as to be an impossibility in a single universe.

But don’t imagine that Koonin’s argument is that therefore there is likely to be purpose, because in contemporary science that cannot be entertained on pain of excommunication. In reply to a reviewer’s comments on a paper in which he puts forward his hypothesis, he states: ‘There is no teleology at all involved in my approach in this paper. No teleology. It is the opposite of teleology.’ After all teleology is, he says, ‘a non-scientific concept’.³⁵ But of course. Teleology is a philosophical concept, though it is perfectly compatible with science.

The only way to avoid it is to posit an infinite number of universes: obviously, in an infinite number of universes everything happens, not because of any purpose, but by exhausting all the possibilities. An infinity of monkeys and typewriters means that every book that ever has existed or could exist gets written. What exactly, though, is the *scientific* status of the concept of an infinite number of universes, for which there is no shred of evidence? Choosing an explanation here is not a matter of science, but of philosophy.³⁶

The multiverse ‘solution’ is a gambit whereby you can never lose an argument, but by the same token never win one either, because everything both is and is not true. It leaves reality untouched. And, by the way, if there is a universe for everything, there will also be one in which there is intrinsic

purpose, so the possibility you most fear is wrapped up in your own supposition. (Unfortunately there must also be one in which there is extrinsic purpose, that of a cosmic engineer with a Meccano set.) Added to which, as astrophysicist Marco Bersanelli points out, ‘we end up with a picture of reality that is dangerously similar to a materialised projection of the set of logical possibilities of our human mind. This may appear even more rigidly *homo-centred* than the anthropic flavour that multiverse speculations seek to remove.’³⁷ Dangerously similar to a materialised ‘projection of the set of logical possibilities of our human mind’: precisely. In other words, the left hemisphere in action again.

In that respect it is like the idea of an engineering God. According to Paul Davies, ‘the general multiverse explanation is simply naïve deism dressed up in scientific language. Both appear to be an infinite unknown, invisible and unknowable system. Both require an infinite amount of information to be discarded just to explain the (finite) universe we live in.’³⁸

To be clear, there can be, in the nature of things, no certain answer to the question of purpose versus multiverse – not just now, but ever.³⁹ The only court before which to bring such a question, like all the most important questions in life, is that of such wisdom as we may have acquired through experience. So reader, your choice: which seems to you the more reasonable? That there is, overall, purpose involved in the way the universe works (implying a conscious cosmos – though, importantly, not entailing an engineering God or a detailed plan, ideas that I explicitly reject); or that what is acknowledged to be essentially impossible by chance is explained by positing an infinite number of universes, in which, by definition, absolutely anything and everything, however improbable, must happen, over and over again for ever? Reductionists, straining at a gnat, swallow a camel. Apart from its intrinsic improbability, and its breath-taking extravagance, the second option means not just the end of science but of all forms of meaning, since if everything happens, nothing *happens* (the root *hap* means chance – what chances to happen rather than not): nothing and everything is equally real, or unreal.⁴⁰ The first, by contrast, is not only far easier to accept, but constitutes the beginning, rather than the end, of meaning, and is perfectly compatible with science, as is obvious, if from nothing else, from the fact that very few of the great scientists on whose work we have long depended believed the universe was purposeless. ‘An

assertion such as “it has no goal or purpose” is a religious response, not a scientific deduction’, writes Steane: ‘That is, such an assertion is not one that is handed to us by the data, it is one that we generate’.⁴¹

Teleological beliefs are not the result of indoctrination in the dogmas of Western culture – though their rejection is. Such beliefs are present from an early age, exist in cultures widespread across the globe, are present in the educated and uneducated alike, and are no less pervasive in science graduates than humanities graduates.⁴² I think those who would dismiss them should explain how they just know teleology has to be mistaken before doing so.

The instinct to reject the sort of God and the sort of design that the machine model implies is surely right; yet Dawkins and his disciples continue to espouse it, just substituting the random installation of a blind algorithm for a divine plan. In doing so they have the least plausible of all worlds: a mechanistic universe, but one without a mechanic. If I believed the universe was mechanistic, I hope I’d have enough insight to be troubled by the question ‘How is it that the universe is such that it *is* so highly ordered that it appears to all observers to have design, given there are no purposes?’ Does that not in itself suggest a purpose at a meta-level? Does not a universe in which there are purposes imply purposiveness is latent in that universe?

AGAINST PURPOSE

Life, it would seem, delights in difference. Life is in essence the drive to differentiation, a process that happens many orders of magnitude faster and more extensively in life than anything in the realm of the inanimate. Indeed it has been suggested that we start from unrelieved uniformity: ‘all particles in the world are fundamentally identical, ie, belong to the same species. Different masses, charges, spins, flavours, or colors then merely correspond to different quantum states of the same particle, just as spin-up and spin-down do.’⁴³ Inanimate substances – at a level beyond mere particles – can be differentiated, however. Iron is different from quartz. But a vast acceleration and simultaneous increase in the complexity of this differentiation is the hallmark of all living things: no two blades of grass are ever the same.

Does any of this, however, demonstrate purpose? Some may object that, as biologist Allen Orr puts it, ‘if nature is trying to get somewhere, why does it keep changing its mind about the destination?’⁴⁴ There are several answers to this question.

First, there is no ‘destination’ to an infinite game, which does not thereby become pointless, but whose purpose lies, not in a heretofore describable end, but, precisely in the continued process itself, wherever it leads.

Second, if you wish to use the ‘destination’ metaphor, it must be with the proviso that the ‘destination’ is in principle unknowable. It is coherent to be trying to get somewhere and to change tack, even if the destination is known – but especially if it isn’t foreknowable. Watch an animal purposefully exploring its environment: its purposiveness is evidenced precisely by the fact that it moves towards, and then backs off from, certain directions and turns in another. If I write a poem, I have a feel of it at the outset, but do not know the completed poem before writing it: there will be forays and retractions. Would you ask me why I didn’t just write the poem straight down and be done with it? The system is open not closed: it must be *flexible*, not rigidly pre-planned. Creation is always like this, and life is one huge act of creation. Yet it would be a basic error to suppose that that meant that the process was random – that the animal had no sense of what it

was about, the poet had no sense of what it was that was coming into being. Earlier I used the example of someone whose declared purpose was to settle down and have children: would you ask her why, if that's the case, she had so many false starts along the way – a way that nonetheless resulted in her achieving her aim? Humans certainly have drives, but their every act is not determined by them, or even in line with them: nor are drives the same as purposes.

Although a drive implies a purpose, a purpose is not identical to a drive, because a single purpose is compatible with a number of sometimes conflicting drives. Thus a purpose that leads to complex and beautiful life may include a drive to compete and a drive to co-operate: indeed it not simply tolerates, but positively requires, them both. And given the free nature of the process, some outcomes we deprecate as evidence of 'bad design' – eg, instances of ruthless competition – are merely evidence that the process is working itself out freely, as it must.

Any path of free creation not only will, but must, err. Blindness at the everyday level is entirely compatible with a purpose overall. But to deny all goals, values or drives in the wider cosmos leaves one able to do no more, when asked why the universe tends to order, complexity and beauty, than shrug one's shoulders and say that they just emerged at random. And that would in itself be no small miracle, suggesting a very special universe.

I have mentioned that life is no respecter of the law of parsimony. One reason often put forward for doubting purpose in the universe is its size relative to the earth: we seem so insignificant. Physicist Robert Park rejects the possibility of purpose thus:

If the universe was designed for life, it must be said that it is a shockingly inefficient design. There are vast reaches of the universe in which life as we know it is clearly impossible: gravitational forces would be crushing, or radiation levels are too high for complex molecules to exist, or temperatures would make the formation of stable chemical bonds impossible ... Fine-tuned for life? It would make more sense to ask why God designed a universe so inhospitable to life.⁴⁵

However, both the scale and the rate of expansion of the universe are *exactly* what would be expected if life were to have any chance of existing

in it anywhere at all.⁴⁶ A smaller more compact universe, or one in which the cosmological constant (which governs the rate of expansion) was only very slightly different from the one that exists, would render life impossible.⁴⁷ ‘Only a universe as big as ours could have lasted the fifteen billion years that are needed to make men and women’, to quote theoretical physicist John Polkinghorne. ‘It’s a process that can’t be hurried’.⁴⁸ The existence of the rest of the universe is simply an affront to our sense of power – the value of the left hemisphere, that of instrumentality. We have no control over the vastness of the universe, so it seems alien and our impotence in the face of it triggers a feeling of insignificance. But the size of the universe is entirely irrelevant. Whether things in our world have value or not is a question *wholly* independent of the size of the universe. I recall a remark of comedian Peter Cook’s: ‘As I looked out into the night sky, across all those infinite stars, it made me realise how unimportant ... they are.’

WARNING: PURPOSE MAY DAMAGE YOUR HEALTH

Instinctual behaviours are characteristically purposeful. I touched on instinctual behaviours in an earlier chapter on embodied and intuitive knowledge. They are deeply embedded drives that do not have to be learnt, and are not consciously pursued. Yet they are supremely purposeful: how to build a nest, how to fly, where to migrate, how to weave a cobweb, the steps of a mating ritual – how to do a thousand things of vital importance to survival. Once again, I say, this has nothing to do with an engineering God. Some of the best examples of purposiveness in nature also happen to be among the best arguments against such a God: if an engineer, then hardly benevolent. Purpose may not further what look to us like benign projects. Let's take a look.

Resistance to chloroquine in the malaria parasite is hardly desirable from the human perspective, and is hard to bring about: it depends on the co-occurrence of simultaneous mutations the chances of which are vanishingly small.⁴⁹ Even when allowing for compensatory mechanisms, 'genetic mutation rates for complex organisms such as humans are dramatically lower than the frequency of change for a host of traits, from adjustments in metabolism to resistance to disease', according to Michael Skinner, a professor of biological science at Washington State University.⁵⁰ There are tendencies acquired in an organism's own lifetime, and embodied in epigenetic changes, that can markedly accelerate processes in the organism's favour, in a way inconceivable by random genetic mutations alone.

Nature makes no judgment on the 'virtue' of her creations. Some of the most ingenious improvisations in Nature are occasioned by parasites and viruses. Even the humble 'winter flu' virus has the effect of making people more sociable, increasing the chances of spread.⁵¹ (Fortunately it doesn't seem to have the same effect on the host's wish to visit the office.) A type of carpenter ant (*Camponotus leonardi*), which is extraordinarily sophisticated – it forages and communicates food sources to comrades, carves wooden galleries to live in, and indulges in farming (the ants corral and protect aphids in order to get a sweet substance called honeydew from them, which they achieve by stroking the aphids with their antennae) –

nonetheless meets its nemesis in the form of a lowly fungus, the so-called zombie ant fungus (*Ophiocordyceps unilateralis*), which exists in rainforests in Asia, Africa and South America.⁵² While the ant forages on the forest floor, it is infected with a spore, which takes several days to develop inside the ant's body. The fungus then takes over the nervous system of the ant and makes it behave entirely against its nature. The ant climbs, always to about the same height, about 25 centimetres up a tree, to a site with exactly the right amount of humidity for the fungus to grow. The fungus then makes its host do something contrary to its nature, to bite onto vegetation, before killing it: the ant clamps onto the underside of a leaf with its mandibles, hanging above its colony, and dies. Within 24 hours, threads of fungus burst out of the corpse. Finally, a stalk thrusts up out of the ant and starts to shower spores onto the rainforest floor, where they, in turn, infect more ants.

The so-called kamikaze horsehair worm (*Paragordius tricuspidatus*) has a similarly ingenious life story. First, the tiny larva is eaten by the larva of another insect, such as a mosquito or mayfly: once this emerges, a cricket will gobble it up. The horsehair worm then develops inside the cricket. However, its final stage of development needs to take place in water. Since crickets don't swim, and don't tend to live near water, the worm has a problem. It solves this by hijacking the cricket's nervous system, impelling it to jump – against its nature – into water. Once the cricket drowns, the horsehair worm is free to emerge and reproduce.⁵³ Now it's got a mechanism, it works well: but how did it survive long enough, as a species, to develop the necessary ability to compel a cricket towards water by sheer chance, given that it needs water to reproduce from the outset? It would fall at the first fence.

And probably the best known of all is the case of toxoplasmosis (a condition caused by the parasite *Toxoplasma gondii*, which can infect humans). This single-celled parasite mainly infects rats and mice, but needs to be eaten by a cat so that it can reproduce. Infected rats and mice bizarrely lose their fear of cats and will even seek them out, making the cat's job easy and the parasite's work done.⁵⁴ It can then, as an *encore*, get into the human central nervous system where its presence is believed to cause behavioural and personality changes, and has been implicated in the genesis of schizophrenia.⁵⁵ Who said purpose was all good, clean fun?

Cancerous tumour cells can suppress apoptosis, a mechanism that ensures the death of excessive cells where appropriate, 'rewire' metabolism, so as to promote the proliferation of blood supply to the tumour, and evade immune responses, in such a way as to promote tumour growth at the expense of the organism.⁵⁶

I bring up these examples because I do not want to be thought of as basing the idea of purpose on a simple idea of an avuncular engineer, which, like Darwin, I cannot accept. But, like Darwin, I am staggered by the ingenious improvisations everywhere in evolution, whether to human sensibilities they be elevating or disturbing. Darwin's writing is full of rapturous appreciation of Nature: in *On the Origin of Species*, he writes 'we see beautiful adaptations everywhere and in every part of the organic world'.⁵⁷ Speaking of the *orchis pyramidalis*, for example, and the adaptation of its parts, Darwin confesses 'I never saw anything so beautiful ... the beauty of the adaptation of parts seems to me unparalleled.'⁵⁸

LIFE TENDS TO COMPLEXITY: WHY?

Aristotle ‘thought he had come across the truth of nature from the moment when he had perceived its beauty’, writes Gilson,

Not so much aesthetic beauty, such as that of light and colours or forms; but first of all and above all the intelligible beauty, which consists in the apperception by the mind of the order which rules the structure of the forms and presides over their relations.⁵⁹

This is remarkably like Darwin’s reaction to beauty, order, and fittingness in nature – and they are there too in what we call the inanimate universe. But why? Saying that things are such that they ‘just do’ naturally behave, as physicists and mathematicians constantly attest, in an orderly and elegantly satisfying fashion, begs the question *why*, unless order, beauty and complexity are natural tendencies. You might object that in fact the general tendency is for order to dissipate; but just as the fact of death doesn’t relieve you of the necessity to account for life, the existence of decay doesn’t relieve you of the necessity to account for the existence of order – nor to account for the tendency, not just of life, but of all complex open systems to buck the trend by unceasingly creating vastly complex order, and in the case of life speeding up the process immeasurably through evolution.

When we look back in cosmic history, says Smolin, ‘we see a universe evolving from less to more structured, from equilibrium to complexity’:

This is certainly not the picture a naïve application of the second law of thermodynamics would suggest. The second law says that isolated systems increase their randomness, becoming more disordered and less complex and structured as time moves forward. This is the opposite of what we see happening in the history of our universe, in which complexity increases as structures form on many scales, with the most intricate structures being the most recent. Evolving complexity means time. There has never been a static complex system.⁶⁰

As he goes on to explain, this does not abnegate the second law of thermodynamics, which applies to closed systems near to equilibrium, and even if a (non-closed) system is increasing in complexity at one point in space it is decreasing elsewhere: ‘as long as the increase in entropy caused by heating a dust grain somewhere in space is greater than the decrease of entropy caused by forming a molecular bond, the long-term outcome is in agreement with the second law.’ The great theoretical physicist Satoshi Watanabe suggested that entropy is not indeed a general law of the universe, and that ‘to speak of the entropy of the entire universe is to risk passing beyond the boundaries of science ... the increase of entropy applies only to what is observed, and consequently not at all to the observer ... The observing self is thus always excluded from the field to which the law of entropy applies.’⁶¹ Since the observing self is a functional part of every known system in science, that is not an insignificant exception.

Claude Bernard, who believed that determinism is ‘the only possible scientific philosophy’, nonetheless wrote that ‘the materialist doctrine is just as imprecise, in that general agents of a physical nature capable of causing the appearance of vital phenomena in isolation do not explain their orderliness, harmony and integration.’⁶² Must there not, then, be a tendency towards such outcomes?

Just as values are foundational in the cosmos, in my view, so is purpose. Leibniz wrote in a letter to de Volder, professor of philosophy and mathematics at Leiden, ‘it may be said that there is nothing in the world except simple substances, and, in them, perception and *appetite*’.⁶³ Nothing ‘just is’ where it is – in this universe everything *tends* somewhere: appetite means literally (Latin, *ad-*, + *petere*) a seeking, in other words, a tendency.

I discussed how conflicted biology is about teleology in Chapter 12: the mistress the biologist cannot live without, but with whom he is unwilling to be seen in public. There I was concerned not with the purposefulness of life, but the purposes of individual creatures. Contemporary physics, too, has found teleology hard to ignore because of a change in the way we conceive probability. Probability, in a Newtonian universe, described our incomplete state of knowledge about something that does not now exist, though at some point in the future it might do. However, according to Heisenberg, ‘the probability wave ... meant more than that’:

it meant a *tendency* for something. It was a quantitative version of the old concept of ‘*potentia*’ in Aristotelian philosophy. It introduced something standing in the middle between the idea of an event and the actual event, a strange kind of physical reality *just in the middle between possibility and reality*.⁶⁴

Potentia is something present and taking part in being. In the Newtonian world, probability is inert and concerns something non-existent; *potentia*, by contrast, is something that implies movement, a ‘tendency towards’ whatever may be, and is something that already exists, now, in a world of fields and forces that already tend to shape the future. In Newtonian probability, the uncertainty lies in our knowledge; in quantum probability the uncertainty lies in the world we aim to know, and is an objective aspect of it. ‘The objective probabilities of quantum mechanics exist even though there is nothing to be ignorant of’, writes David Mermin:

They express correlations in the absence of correlata. To avoid such linguistic traps it would be better to speak not of ‘probabilities’ but of ‘propensities’ or ‘dispositions’, or to eschew all talk of probability in favour of talk about correlation.⁶⁵

LIFE AND THE PURPOSES OF THISNESS

Returning to biology, I suggest that living beings are neither purposeless nor random, but have, as well as goals of their own, intrinsic purpose. It is not that ‘Nature has a purpose’ of which individual creatures are the passive victims: Nature’s purposiveness includes and is predicated on the freedom of her creatures, each of which expresses its purpose, which ahead of time she does not know, through her. Every creature, in Hopkins’ phrase, cries ‘What I do is me: for that I came.’ Note, ‘*for that*’: the purpose is right there, in the very thisness, quiddity, *hæcceitas*, of each unique being. We are grateful for the existence of things *in themselves*, for no other reason. Life is a dance – a celebration; and it has the nature of a gift. It is neither a mechanism to be exploited nor a problem to be solved.

One might query whether claiming that, eg, ‘a lion has a purpose’ says any more than that we value the lion. That in itself is no mean thing, since, as I have said, it looks like the purpose of the emergence of life from consciousness is to enable the recognition of value. But I’d answer that the lion has that purpose *whether we value it or not*, indeed whether beings capable of valuing it existed or not. I think that one of the many things that human awareness brings to the party (granted all the disadvantages of the species) is that it helps fulfil that intrinsic purpose – of the production of untold richness of difference – by its greater capacity to appreciate it. (The greater the shame if we fail to do so.) ‘Born to blush unseen’, the flower still has a purpose, or purposes: being; continuing-in-being; and continuing-in-being-by-reproduction. Once *seen*, however, its purpose is more richly fulfilled – its resonances are wider. Incidentally, as Leon Kass says, in relation to continuing in being, ‘very few people have noticed that this [Darwinian] non-teleological explanation of change not only assumes but even depends upon the immanent teleological character of all living organisms. The desire or tendency of living things to stay alive and their endeavour to reproduce, both of which are among the minimal conditions of Darwinian theory, are taken for granted and unexplained.’⁶⁶ Why, after all, make so much effort, embrace so many sacrifices?

A point worth pondering. After all, by far the best strategy for *persisting in being* is to avoid being alive at all. How is it that life ever took off? As

Whitehead observes,

life itself is comparatively deficient in survival value. The art of persistence is to be dead. Only inorganic things persist for great lengths of time ... The problem set by the doctrine of evolution is to explain how complex organisms with such deficient survival power ever evolved. They certainly did not appear because they were better at that game than the rocks around them. It may be possible to explain “the origin of *species*” by the doctrine of the struggle for existence among such organisms. But certainly this struggle throws no light whatever upon the emergence of such a general type of complex organism, with faint survival power.⁶⁷

And once they arrived, why did organisms further evolve towards creatures with vastly lower survival prospects? A tree can live a thousand years. A human life is on average 70–80 years, and until recently considerably less. Individual examples of some actinobacteria, however, are thought to be over a million years old, and still going strong.⁶⁸ In the survival stakes we lose hands down to a monocellular organism.

As I have often had occasion to remark, creativity depends on a degree of resistance. It seems to need to overcome adversity. ‘The life energy has to overcome the obstacles erected not only by matter but by life forms as well’, writes Kolakowski:

the results usually turn against the principle of creativity itself, as in human efforts of expression: once produced, each form sticks to its identity and resists further changes. But the original force never sleeps. The species which focus their efforts on building defensive shelters and shells usually close the road to progress, whereas those that take greater risks and buy flexibility of movement at the price of weakened armour, prove to be winners in terms of evolution.⁶⁹

As Taleb points out, being robust is weaker than being antifragile.

While Occam’s razor must be observed in pursuing human explanations, there is no *lex parsimoniæ* – no principle of parsimony –

governing the natural order. It is an extravagantly creative, inventive, superabundant, self-delighting process. As von Bertalanffy observed:

If life, after disturbance from outside, had simply returned to the so-called homeostatic equilibrium, it would never have progressed beyond the amoeba which, after all, is the best adapted creature in the world – it has survived billions of years from the primaeval ocean to the present day. Michelangelo, implementing the precepts of psychology, should have followed his father's request and gone into the wool trade, thus sparing himself lifelong anguish although leaving the Sistine Chapel unadorned.⁷⁰

Whitehead, speaking of the determination with which humans set about modifying their environment, wrote: 'the explanation of this active attack on the environment is a three-fold urge: (i) to live, (ii) to live well, (iii) to live better. In fact the art of life is *first* to be alive, *secondly* to be alive in a satisfactory way, and *thirdly* to acquire an increase in satisfaction.'⁷¹

All that we have considered here seems to me to speak of mind, not just in the sense of awareness, but of ingenuity and purpose. As Kass says, 'do we really understand what we are claiming when we accept the view that a mindless universe gave rise to mind?' ⁷²

PURPOSE IN MIND AND TIME

One aspect of mind in the cosmos would be the ability to ‘see’ beyond the immediate, not just to register this moment, but to have some ability to situate it in a trajectory over time. There are elements in evolution which appear to require some such oversight of the general path, though there is no tendency to interfere in the detail: elements which seem to take greater account of the broader view in time and space than the highly focal vision of mechanism would allow. If Shapiro is right that all life has cognition, this is not strange: it is to be expected.

As Bruce Charlton argues, there may be many reasons for evolution ‘preferring’ something *once it exists*, without it being at all obvious how that something would have come into existence in the first place in order to be subsequently preferred. His point is similar to Whitehead’s. An everyday example of it is the existence of sexual reproduction. In the short-to-medium term, as he points out, needing to find a suitable member of the opposite sex with whom to reproduce greatly reduces the chances of reproductive success, and at the same time halves the number of potential reproductive units. Once established, it works – but at the outset there would be grave competitive disadvantages without their being offset by the advantages that come only further down the line. How this happened remains, as he puts it, ‘utterly unclear.’⁷³ In evolution there are many instances with a similar structure: that is to say, an initial development in a process that will one day reach a desirable goal, is either neutral, or actually negative, and therefore unlikely to be selected for.

Similarly there are advantages in altruism from a point of view of the group, once established, but very few for the first altruists:

In a multi-cellular organism, the dividing component cells are constantly being naturally selected for neoplastic (eg cancerous) change – such that they cease to cooperate with and contribute to the organism, and instead exploit it as a ‘host’ environment.⁷⁴ How, then, did multicellular organisms evolve the many integrative systems (eg nervous, paracrine, hormonal and immune systems) designed to impose cooperation of specialized cells and suppress

non-functional and actively parasitic (eg mutated) cell variants; bearing in mind that all such integrative systems are themselves intrinsically subject to neoplastic evolution (as well as loss of function from cumulative damage)?⁷⁵

Why, Charlton asks, does development of multicellular organisms not ‘utterly collapse into a chaos of ever smaller and faster replicating, more mutually exploiting purposeless entities, as we observe it does not?’ The net effect of natural selection, as he points out, is to break down the major transitions of evolution before they can be established, unless the tendency is overcome by a purposive (‘and indeed cognitive’), integrative and complexity-increasing tendency, which is able to avail itself of a longer-term view: an intentional arc, to use Merleau-Ponty’s phrase.

Charlton deduces that there must be a mechanism of teleological intent, either in the form of a hitherto unknown source of information built into the cell’s own structure, or in the form of a field that acts on the whole form, much as Sheldrake has proposed. He gives a couple of familiar examples:

the mechanisms of cell-suicide or apoptosis – such that if a cell experiences a mutation that may endanger the organism ... the cell destroys itself (for the good of the whole organism) ...

Some types of motile white blood cells such as macrophages (which resemble free living amoebae) will kill themselves in the process of defending the organism against microorganism invasion ... and this purpose is apparently built into them in terms of their core functionality.⁷⁶

He concludes that there is, in general, considerable altruism built in at the cellular level of a multicellular organism. This seems undeniable. I would incline towards there being something that operates not just at the level of the single cell but at the level of the whole organism (and of course these ideas are not mutually exclusive: both may be required). I showed in Chapter 12 a number of examples of situations in which the whole organism seems to become aware of a problem in a perhaps isolated part of it, and responds not only as a whole (rather than just locally), but sometimes with

an entirely novel strategy for which it could never have been 'programmed'.⁷⁷

The conventionally proposed solutions to problems of altruism, 'such as inclusive fitness/kin selection and various types of reciprocal benefit'⁷⁸ answer a different question, namely, why altruism, *once established*, is advantageous and worth sustaining, not how it came into being in the first place. To prevent 'the amplification of selfish, short-termist, parasitic variants and lineages (which are immediately advantageous, and much more strongly selected for)', observes Charlton, requires some countervailing tendency that favours long-term cohesion, and the survival and reproduction of the group. This sounds to me like purposefulness.

Such a tendency is a sign that things are better thought of as being attracted towards certain goals, rather than pushed blindly forwards by a mechanism from behind. Blind processes can't 'see' ahead to let a future aim guide a present development. James makes the point thus:

Romeo wants Juliet as the filings want the magnet; and if no obstacles intervene he moves towards her by as straight a line as they. But Romeo and Juliet, if a wall be built between them, do not remain idiotically pressing their faces against its opposite sides like the magnet and the filings with the card. Romeo soon finds a circuitous way, by scaling the wall or otherwise, of touching Juliet's lips directly. With the filings the path is fixed; whether it reaches the end depends on accidents. With the lover it is the end which is fixed, the path may be modified indefinitely.⁷⁹

I am reminded, and not for the first time, of Dupré's analogy of asking a friend to buy a loaf of bread: specifying the goal is vastly more likely to produce the desired result than specifying the individual actions to be taken to get to the shop. One ought to take into consideration how often certain common outcomes are arrived at through different processes of exploration. Evolution is full of examples whereby a similar end is repeatedly arrived at by different means, sometimes even in related, or the same, organisms. Simon Conway Morris demonstrates that evolution converges: the same patterns of outcome keep attracting evolution. This doesn't look like aimlessness or lack of purpose.

Consciousness is, in its essence, always disposed *towards something*; its nature is to be a reaching out. Similarly, always reaching out beyond itself, it favours, or tends towards, its own greater complexity. Consciousness can not only purpose the creation of utility, an end that is now in sight, but seems able to purpose something which, more like a work of art, can be known only once it is achieved. Here again a longer trajectory of sight or insight than the immediate, local cause and effect feedback mechanism seems to be required. I come back to Bergson, as interpreted by Kolakowski:

Life, then, is a continuous process in which the original drive divides itself into a growing variety of forms, but retains a basic direction. It has no goal, Bergson says, in the sense that human actions have goals, in other words, no one can anticipate its future course, which is more similar to an artistic creation than to the operation of a machine.⁸⁰

Teleology in nature, then, is not just a matter of purposing solutions to local problems, but a tendency towards greater complexity and higher levels of awareness. And this requires a sense of the trajectory of time. At the simplest level, Prigogine comments:

Figuratively speaking, matter at equilibrium, with no arrow of time, is 'blind', but with the arrow of time, it begins to 'see'. Without this new coherence due to irreversible, nonequilibrium processes, life on earth would be impossible to envision ...⁸¹

Is denial of purpose coherent? At the beginning of Part II, I quoted Bacon: 'The universe is not to be narrowed down to the limits of the understanding, which has been men's practice up to now, but the understanding must be stretched and enlarged to take in the image of the universe as it is discovered.' We have been very successful in applying a methodology, that of ever further analysis to mechanisms, that strips the universe of any coherence at a higher level. As Whitehead observed:

The brilliant success of this method is admitted. But you cannot limit a problem by reason of a method of attack. The problem is to understand the operations of an animal body. There is clear evidence that certain operations of certain animal bodies depend upon the foresight of an end and the purpose to attain it. It is no solution of the problem to ignore this evidence because other operations have been explained in terms of physical and chemical laws. The existence of a problem is not even acknowledged. It is vehemently denied.⁸²

And he continues: ‘Scientists animated by the purpose of proving that they are purposeless constitute an interesting subject for study.’ Thomas Nagel picks up the implications of proving oneself the mere product of randomness: ‘Evolutionary naturalism implies that we shouldn’t take any of our convictions seriously, including the scientific world picture on which evolutionary naturalism itself depends.’⁸³

I fear that an over-simplified vision is, as usual, the problem here. In the view of Nobel Prize-winning physicist Charles Townes,

People are misusing the term intelligent design to think that everything is frozen by that one act of creation and that there’s no evolution, no changes. It’s totally illogical in my view. Intelligent design, as one sees it from a scientific point of view, seems to be quite real ... design could include evolution perfectly well. It’s very clear that there is evolution, and it’s important. Evolution is here, and intelligent design is here, and they’re both consistent...⁸⁴

It was Descartes’ ambition, through science, to ‘render ourselves, as it were, the masters and possessors of nature’.⁸⁵ I believe that a significant motivation for the resistance to the idea of purpose is the implied affront to our sense that there must be no theoretical limits to the power we may aspire to have over nature: and as the philosopher Étienne Gilson comments, there is no place for final causality in such a scheme.⁸⁶ Only we are allowed to have purposes; the rest must submit passively to ours.

CONCLUSION

In this chapter I suggested that the concept of teleology is quite compatible with science, and that denying it leads to improbable claims, to a loss of substance, as Ernst Mayr suggested, and a failure to ask the right questions about *how* purpose works as a force in Nature. I also suggest that there has been confusion about what is meant by purpose, and a fear that it implies an engineering God, which it does not. This brings me to a turning point in the course of the book.

All that I have covered so far in Part III suggests that the cosmos is likely to be differently constituted from the way we have come to believe. That leaves unaddressed an issue of a quite different order: the mystery *that* the cosmos should exist at all, and exist in the way I have accounted for it up to the end of this chapter. This is an order of questions that it is beyond science's reach to answer, although philosophical or theological approaches to these questions can and should be informed by whatever science can tell us that might prove relevant; and whatever each of reason, intuition and imagination at any time can tell us. It is in that spirit, and to this different order of questions, that I turn in the next chapter.

THE SENSE OF THE SACRED

As a human being one has been endowed with just enough intelligence to be able to see clearly how utterly inadequate that intelligence is when confronted with what exists. If such humility could be conveyed to everybody, the world of human activities would be more appealing.

—*Albert Einstein*¹

The first gulp from the beaker of knowledge estranges us from God, but at the bottom of the glass God is waiting for him who seeks.

—*Carl Friedrich von Weizsäcker*²

By love He can be caught and held, but by thinking never.

—*the author of The Cloud of Unknowing*³

For every thing that lives is holy, life delights in life...

—*William Blake*⁴

THE GROUND OF BEING

FOR ME, AND FOR MANY PHILOSOPHERS HISTORICALLY, THE DEEPEST question in all philosophy – both the most important, and the hardest to answer – is why there should be something rather than nothing.

And close on its heels comes the question why that ‘something’ turns out to be complex and orderly, beautiful and creative, capable of life, feeling and consciousness, rather than merely chaotic, sterile, and dead. It is not a matter of opinion, but a fact if ever there was one, that, somehow or other, this ‘something’ has within it the capacity to give rise to Bach’s *St Matthew Passion*. Any attempt at understanding the cosmos needs to take that stark fact into account. There is a parallel between the false view that we are separate from and over against Nature (encapsulated in the disastrous idea of Nature as the ‘environment’) and the idea that we are separate from and over against the cosmos. This cannot be true, for the same reason in either case. We were born out of, and return to, the one and the other. It therefore makes no sense to set us up as proud, lonely, tragic figures, struggling against Nature, trying to subdue her, or struggling defiantly to bring love, goodness and beauty into a hostile cosmos. Any love, goodness and beauty we can bring come out of Nature and out of the cosmos in the first place: where else can they possibly come from? ⁵

Moreover how is it that, as Deutsch pointed out, the universe is intelligible? Not only that, I might add, but how is intelligence possible unless intelligence is in some sense ‘part of the stuff of the universe’? I am not speaking of information-processing, but of *understanding*, which is what intelligence literally means: a phenomenon to which we are so close that we hardly perceive its uniqueness. Taking it for granted is a rather big assumption: don’t let its familiarity lead to underestimating its magnitude. If we are invited to assume (as we are) that the cosmos consists of mindless matter, the problem arises of how such an *unintelligent* cosmos is constructed so that intelligence might arise *de novo* in it, engage in the business of comprehension, and find it comprehensible. If that doesn’t trouble you, you are missing something: intelligence looks disquietingly like an intelligent idea rather than a property of mindless matter. I believe this was what Einstein meant by his famous words: ‘The eternal mystery of

the world is its comprehensibility ... The fact that it is comprehensible is a miracle.’⁶ However, let’s set these questions aside for now, and focus on the more fundamental question: why there should be anything at all, rather than nothing.

The question is frequently misunderstood as ‘what was the first element in the chain of causation that led to the existence of the universe?’ But that is an entirely different question (and there may be no such first element at all, since for all we know the universe may have no beginning in time). It is not a question of a temporal cause in a sequence, one lying on the same plane as the sequence itself, but of an ontological cause, underlying and sustaining any such sequence. In other words, not ‘what was it that set some process in motion at a point in time?’, but, rather, ‘how does it come about that there is a process, or motion, or a point in time, at all – now or ever?’ The answer to this question is of an altogether different order, and must lie on a plane different from, and deeper than, everything else. The question cannot be answered in terms of a physical entity or process, because that already presupposes what we are questioning – why there are physical entities and processes. The proper object of this question is that which underwrites, timelessly and eternally, whatever is: in other words, the ground of Being. This is, I believe, what Wittgenstein was referring to when he wrote that ‘the mystical is not *how* the world is, but *that* it is.’⁷ Similar reflections have been made by philosophers at all times and in all places since the very beginnings of philosophy.

Wittgenstein, among many others, saw a mystery here; others only something so self-evident as to warrant no further discussion. Wittgenstein had foreseen that, too. ‘God grant the philosopher insight into what lies in front of everyone’s eyes’, he wrote.⁸ A deep mystery may be clothed as a commonplace that, for that very reason, we can scarcely see at all. And what eagerly presents itself to us as obviously the case may be a deception. In the months before the outbreak of the First World War, Evelyn Underhill observed that:

the surface-self, left for so long in undisputed possession of the conscious field, has grown strong and cemented itself like a limpet to the rock of the obvious ... building up from a selection amongst the more concrete elements offered it by the rich stream of life, a defensive shell of ‘fixed ideas’. It is useless to speak kindly to the

limpet. You must detach it by main force. That old comfortable clinging life, protected by its hard shell from the living waters of the sea, must now come to an end.⁹

This surface-self, the possessor of the conscious field, attached to its fixed ideas, which it sees as resoundingly obvious, will be recognisable to the reader of this book as an expression of the left hemisphere's *modus operandi*. For the surface-self, the limpet on the rock of the obvious, there is no mystery about Being: it is simply self-evident. But we must disturb its complacency.

First, however, I should enter an important caveat, without which my purpose may be misunderstood. In what follows I have of course no final answers to any of the big questions. But I believe we must not, under any circumstances, cease to be mindful of these questions, even while we know there can be no definite answers. Having ready answers means you don't understand; understanding here means never letting go of the questions. Unknowing will turn out to be a sign not of weakness, but of wisdom.

To many people speaking of a ground of Being is entirely pointless: after all, what grounds the ground of Being? And so on, *ad infinitum*. But that is to misunderstand. In speaking of the ground of Being, we do not provide an answer, but draw attention to a problem. The point is not to make a question go away – 'well, that's that sorted, then!' – but rather to place it centre stage, and allow the light, in time, to dawn.

I am certainly not attempting to argue for the existence of God: no argument for, or against, the existence of God can possibly succeed. Moreover, as you will see, I believe the concept of God to be fraught with difficulties. Whether it can be rehabilitated in some form is a question I will come to, but I suggest that for now the reader put it out of mind, with all its unhelpful baggage, which has a tendency to get between us and seeing something important. In particular in what follows I am not trying to revamp some version of a cosmological or ontological 'argument' for the existence of God. I am merely indicating that, whatever we choose to call it, there is almost certainly more here than we have words for, or can expect ever to understand using reason alone. Such an expectation would itself be irrational. The proper response to this realisation is not argument, but awe. To be human, in my view, is to feel a deep gravitational pull towards something ineffable, that, if we can just for once get beyond words and

reasons, is a matter of experience, and to which we reach out, silently, though not without misgivings; something outside our conceptual grasp, but nonetheless present to us through intimations that come to us from a whole range of unfathomable experiences we call ‘spiritual’. This has been true of humanity the world over and throughout time, and is true now as much as ever; no advance in science can have anything to say about it one way or the other. To think that it could is to misunderstand science as much as spirituality.

Almost a defining characteristic of the left hemisphere is that it has no sense of the limits of its own understanding: it doesn’t know what it is it doesn’t know. It operates inside a framework, within which all questions are referred back, and all answers form part of a reassuringly familiar schema; if they don’t, they are simply pronounced nonsense. But it doesn’t see the bounds of its own world view; in order to do that, it would have to see there is something beyond the bounds – and that is something it cannot do. The right hemisphere, on the other hand, is turned outwards, attentive to whatever comes to it, without attempting to make it conform to the familiar, or to the uses of everyday language. It alone therefore ‘purges from our inward sight the film of familiarity which obscures from us the wonder of our being’.¹⁰ It has the capacity to express what it perceives, but this can be done only indirectly, through metaphor and myth. To quote Whitehead: ‘The difficulty of philosophy is the expression of what is self-evident ... Our understanding outruns the ordinary usage of words. Philosophy is akin to poetry.’¹¹ Understanding poetry depends heavily on the right hemisphere.

Nothing is less true than that we understand something only when we express it in language. On the contrary, language at times places a barrier between us and understanding, substitutes a crabbed expression for a living reality, and pretends to ‘explain’ it – away. Thought often far outstrips language: it has been a recurrent theme in this book, and I explored much of the evidence in *The Master and his Emissary*.¹² The philosopher Bryan Magee again hits the nail on the head:

How does one say the *Mona Lisa*, or Leonardo’s *Last Supper*? The assumption that everything of significance that can be experienced, or known, or communicated, is capable of being uttered in words would be too preposterous to merit a moment’s entertainment were

it not for the fact that it has underlain so much philosophy in the twentieth century...

And he continues in words I have already quoted, ‘direct experience which is never adequately communicable in words is the only knowledge we ever fully have’.¹³

Things that can be understood only by direct experience can be spoken of only indirectly: and conversely what is talked about directly is usually experienced only indirectly, because in the process of articulation it has inevitably become a re-presentation – something *other* than what we experience. Nietzsche thought that distortion was not just a limitation of language, but of its essence. And it is true that the more important something is, the harder it is to grasp in language. ‘Most events are unsayable, occur in a space that no word has ever penetrated, and most unsayable of all are works of art’, wrote Rilke, ‘mysterious existences whose life endures alongside ours, which passes away’.¹⁴

Not just language, but the thinking to which it is allied, has strict limits. Deep intuitions can flourish only when there is enough space granted by *not* knowing, in the recognition that conventional ‘wisdom’ does not apply. What we take to be ob-vious may prove an ob-stacle; it may ob-trude on, ob-fusate, ob-struct, ob-scure, and ultimately ob-literate the truth. In fact the meaning of the word ‘obvious’ (Latin, *ob-* against, + *via* way) is that which stands ‘in the way’ – in both the good sense, that it is what we first encounter on the highway of our cognition, and the bad sense, that it impedes our path. We must always be alert to precisely what our customary way of thinking leaves out. This is not just true of poetry: ‘If the study of science teaches one anything’, writes Polkinghorne, ‘it is not to take everyday thought as the measure of all that is.’¹⁵

Language is a tool that was evolved for everyday use. In philosophical thinking of all kinds, according to Whitehead, we wrestle with ‘the difficulty of making language express anything beyond the familiarities of daily life ... the struggle of novel thought with the obtuseness of language’: one of the problems of philosophy, according to him, was the ‘uncritical trust in the adequacy of language’, for ‘in philosophy linguistic discussion is a tool’ – it is a useful servant – ‘but should never be a master’.¹⁶

Speaking of the ground of Being, the Zen monk Shunryū Suzuki writes: ‘The true source, *ri*, is beyond our thinking: it is pure and stainless. When

you describe it, you put a limitation on it. That is, you stain the truth or put a mark on it.’¹⁷ In the *Analects* of Confucius it is written: ‘The Master said, does Heaven speak?’¹⁸ Famously Lao Tzu tells us that ‘the *tao* that can be named is not the eternal *tao*’.¹⁹ In the Eastern tradition, then, there are many such statements of the impossibility of capturing the source of all things in language. What is interesting is that they are also plentiful, as I shall demonstrate, in the Western sacred – though not secular – tradition. That very opposition, sacred versus secular, however, is in itself typically Western. It is a sign of a significant rupture that never existed in the same degree in other cultures, and should never have existed in our own. It is the result of the progressive sequestration of the sacred, whatever is by definition of the highest possible value, from the centre, to its present ghetto on the margins, of Western mental life.

DENYING THE GROUND OF BEING

Since what cannot be expressed, and must always remain implicit, is antithetical to the left hemisphere's way of being, the immediate reaction from those approaching the problem from a purely analytical perspective is to deny the topic of the ground of Being altogether: the question or questions are said to be non-questions, or to make no sense. To me, while such a conclusion may well follow from the narrow premisses of such an approach – a quick trip round the hall of mirrors confirms whatever we already believe – it does not measure up in any way to the experience of the simple fact of Being, if one allows oneself truly to face it, and does not succeed in sidestepping it by a convenient intellectual reflex.²⁰ Nor is it in line with my reading of the ancient wisdom literature of East or West, which I am not able to dismiss just because a perhaps fashionable school of contemporary philosophy does not agree with it.

Attempts to dispense with the problem follow a number of approaches. First, it might be said that, although everything we know is sustained in its being by the existence of other existences, in the case of the universe, there is an exception – ultimately there must just be an uncaused cause, or an ungrounded ground. But this is to affirm a unique ground of Being, not to negate it. The philosopher Jakob Boehme actually refers to the fount of all being as the 'unground' (*Ungrund*) – a ground to be understood in a sense like no other. In whatever way we recast it, we are faced with an exception, and an exception that cannot be rationalised so as to be safely packed away again within our familiar categories.

Another is to rely on brute 'emergence'. Being simply – somehow, it is claimed – emerged out of Nothing: nothing here to explain. But by this strategy the existence of a miracle is not denied, but confirmed: one miracle is simply recast as another. This type of argument is familiar to us from our discussions of consciousness, and it is no more successful here than it was there. Just as the emergence of consciousness out of matter wholly devoid of consciousness is a miracle, brute emergence of Being from non-Being is either the miracle of all miracles or a straight impossibility. Does it happen at a stroke? A miracle. Or does it truly *emerge*? An impossibility: for it falls prey to the 'Midshipman Easy problem', of which it is surely the most

extravagant case. Being is not something that can happen gradually, beginning with a *very little bit* of Being that *slightly* is. The mystery remains.

It has also been suggested that there is no mystery because there is nothing here to explain, since the sum of all the electrical charges, angular momenta and energy quanta in the cosmos is zero: thus, it is claimed, absolutely nothing has unfolded into absolutely nothing. But as Rupert Shortt points out, this is like arguing that the Taj Mahal doesn't amount to anything, because it contains the same volume of stone as was quarried from the ground to make it.²¹ (NB this is *not* an argument for an engineering God.) Others have suggested that Being might have emerged from a quantum vacuum; but a quantum vacuum is not Nothing. It, manifestly, has being: it is a physical entity and obeys the laws of physics. We saw that the physicist David Tong describes it as 'the simplest thing we can imagine in the entire universe and it is astonishingly complicated.'²²

Yet another argument that there is nothing here to explain asserts that the laws of physics alone are enough to account for things coming into existence. There are numerous problems with this line of reasoning. For a start, physical theories claiming to show how the universe could spontaneously arise from nothingness invariably turn out, like the quantum vacuum case, not to be that at all. They involve, as David Bentley Hart points out, 'transition from one physical state to another, one manner of existence to another, but certainly not the spontaneous arising of existence from nonexistence.' Such an event is impossible within physics.²³ Existence is 'most definitely not a natural phenomenon', he continues; 'it is logically prior to any physical cause whatsoever; and anyone who imagines that it is susceptible of natural explanation simply has no grasp of what the question of existence really is.'²⁴ To repeat, my point is not that I can explain existence: I can't. I merely question the claim that there is nothing here to explain.

Further, the identification of so-called laws does not answer anything. What grounds the laws, if there is absolutely Nothing? We are concerned with that which is prior to and underlies all systems, underwrites all so-called laws, and everything whatsoever. And even if there is something – namely, laws – how could these laws themselves unfold the infinitely complex universe? Laws cannot cause anything to happen. They are merely a description of an observed regularity in phenomena. What causes the

observed regularity remains unspecified and is unaltered by being labelled a law. What's more, laws have to operate on something. Even if some handwaving were to 'grant' (ie pass over) initial conditions and a set of laws to operate on them, there are two questions which the Newtonian paradigm will never be able to answer: 'why these laws?' and 'why these initial conditions?'²⁵ Thus the universe may well operate according to the principles of natural selection, as has been claimed; but it cannot be *explained* by a process such as natural selection, since natural selection operates according to principles ('laws') that natural selection cannot itself explain.²⁶ So Wittgenstein declared: 'At the basis of the whole modern view of the world lies the illusion that the so-called laws of nature are the explanations of natural phenomena.'²⁷

TALKING ABOUT THE GROUND OF BEING

Being, then, is mysterious. The problem is that if we are to say anything about it, we still need some sort of placeholder, within language, for all those aspects of Being that defy direct expression, but which we sense are greater than the reality which language is apt to describe, almost certainly greater than whatever the human mind can comprehend. If we don't have such a placeholder they will disappear from our awareness; yet *what* that placeholder signifies must not, above all at first, be tied down too tightly – if indeed it ever can be. In this it is rather like learning a language from experience only, without a grammar book or dictionary: in such a process what a word means must be initially left open, and narrowed only with deeper and repeated acquaintance. A drive for precision at the outset becomes the enemy of understanding. 'The pretension, under such conditions, to be rigorously "scientific" or "exact" in our terms', writes James, 'would only stamp us as lacking in understanding of our task.'²⁸

What we need, in fact, is a word unlike any other, not defined in terms of anything else: a sort of *un*-word. This is no doubt why in every great tradition of thought – and perhaps beyond that, in every language of every people – there *is* such an *un*-word. It holds the place for a power that underwrites the existence of everything – the ground of Being; but, as I shall suggest, it holds a place for more than that, otherwise some such phrase as 'ground of Being' would itself be enough. To Heraclitus it was the *logos*; to Lao Tzu the *tao*; to Confucius *lǐ*; in Hinduism *Brahman*, and to the Vedic tradition *ṛta*; in Zen *ri*; to Arabic peoples, since pre-Islamic times, *Allah*; to the Hebrews *YHWH*.²⁹ And in the Western tradition it is known as God.

But what a host of troubles lies in that name ... There is a very good reason why in most traditions there is a prohibition on use of the *un*-word. It is inevitably a mendacious re-presentation of ultimate truth – that is to say, an idol. And the word God is obfuscated and overlaid with so many unhelpful accretions in the West that it is not surprising that people recoil from this idol. It's not just that, obviously, God is not some old man sitting on a cloud, but that very much else that is often believed, or at any rate

assumed by atheists to be believed by theists, badly gets in the way of an understanding.

Here is the dilemma, and why I speak of an un-word: if we have no word, something at the core of existence disappears from our shared world of awareness; yet if we have a word, we will come to imagine that we have *grasped* the nature of the divine, pinned it down and delimited it, even though by the very nature of the divine this is something that can never be achieved. So we find, as we might expect, that there are parallels in the Western tradition to Lao Tzu's admonition that the *tao* is unnameable and inapprehensible. In Judaism the name of God is the Unnameable Name. 'God is something that cannot be and, at the same time, has to be spoken of', wrote Kolakowski. 'No logical devices will make this tension vanish.'³⁰

And what is true of language is a symbol of what is true in thought. 'There never was nor will be a man who has certain knowledge about the gods and about all the things I speak of', wrote Xenophanes. 'Even if he should chance to say the complete truth, yet he himself knows not that it is so.'³¹ In Buddhism, Hinduism and each of the monotheistic religions, Islam, Judaism and Christianity, there is an ancient and powerful apophatic tradition, or *via negativa*, which holds that all positive assertions about God will be false: we must approach God by clearing away untruth, as we reveal the statue by discarding stone from the primal block. So St Augustine warns that 'if you understand, it is not God you understand'.³² That does not mean, however, that the attempt is pointless, or that we are absolved from making the attempt. As the polymath Nicholas of Cusa, whose greatest work is entitled *On Learned Ignorance*, put it: 'the deeper we know our unknowing, the nearer we are to truth'.³³

Odd as it may seem, and though it is impossible to avoid the form of words 'God's existence', it is even arguable, without denying God, that God does not exist. The twelfth-century Jewish philosopher Maimonides, for example, says that God 'exists, but not through existence.'³⁴ If you are frustrated by this deeply paradoxical form of words, I can understand; but do not succumb to the temptation to dismiss it. His point is an important one: that to predicate existence of God is to mistake the divine nature. God cannot be said to 'exist', a word which in its origins means to 'stand forth' (Latin, *ex-* out, + *-sistere*, reduplicative of *stare*, to stand) in the way that a *thing* stands forth for us against the ground of our already existing field of

vision. God *is* that ground. God is above all not a thing alongside other things – even one equipped with ultra-special powers. God simply *is* – in a use of the verb that requires that we understand God both to *have* Being and to *be the ground* of Being at one and the same time. In similar manner, the Origin (*Ursprung*) referred to by the philosopher Jean Gebser is the source from which all springs, but it is also that which itself springs forth.³⁵ And again Suzuki says, reflecting on the *Sandokai*, once more using the image of water:

In the darkness the branching streams flow everywhere, like water. Even when you are not aware of water, there is water. Water is inside our physical body and in plants too; there is water all over. In the same way the pure source is everywhere. Each being is itself pure source, and pure source is nothing but each being. They are not two things ... The stream is pure source, and pure source is the stream. The pure source is flowing all over, even though you don't know it. This 'don't know' is what we call 'dark', and it is very important.³⁶

And in the Sufi tradition, the poet Rumi writes: 'Truly it is the water; that which pours; and the one who drinks – all three become one when your talisman is shattered. That oneness you can't know by reasoning.'³⁷

In connexion with this, the theologian and philosopher Paul Tillich also makes what at first sight is a puzzling observation about the way we think, which emphasises that we misunderstand all aspects of being that are not thing-like when we try to render them as things. 'Nothing, perhaps, is more symptomatic of the loss of the dimension of depth', he says,

than the permanent discussion about the existence or non-existence of God – a discussion in which both sides are equally wrong, because the discussion itself is wrong and possible only after the loss of the dimension of depth. When in this way man has deprived himself of the dimension of depth and the symbols expressing it, he then becomes a part of the horizontal plane. He loses his self and becomes a thing among things.³⁸

The point I believe Tillich is making is that we cannot rightly speak of God's existence (or non-existence) for several, loosely associated, reasons. One is that to speak in such a way is to imagine God as a thing in the world alongside other things, such as bus passes and mountain bikes, just much, much grander. As a result, the field of possibilities has become two-dimensional, which Tillich refers to as the loss of the dimension of depth (he also implies, in my view rightly, that, in this loss, our lives, too, become lacking in depth). Another is that it makes Being ontologically prior to God, as though existence was an *attribute* of God: but Being cannot 'validate' God, since it is God, if there is a God, that 'validates' Being. As the late fifth-century mystic Dionysius the Areopagite says, God is 'the cause of being for all, but is itself nonbeing, for it is beyond all being.'³⁹ But the most fundamental reason that 'the discussion itself is wrong' is that it suggests that invoking God is an *explanation* on the same level as, and as a potential alternative to, invoking the laws of thermodynamics. John Gray refers to

the 'God debate' – a tedious re-run of a Victorian squabble between science and religion ... the idea that religion consists of a bunch of discredited theories is itself a discredited theory – a relic of the nineteenth-century philosophy of Positivism.⁴⁰

Science helps inform philosophy and philosophy helps ground science. The quest of science must tend always beyond what current science sees – and not only within science. It has a role in leading on to metaphysics. Aristotle implied that, in addition to each science studying its own peculiar subject matter, the sciences 'have a further function as leading to a goal outside themselves, namely the discovery of what they logically *presuppose*.'⁴¹ (I have addressed the fallacy that science makes no presuppositions in an earlier chapter.) Aristotle called this foundation *sophia*, wisdom, or *theologikē*, discourse about God. He thought that the subject of metaphysics was the ground of Being, and that therefore metaphysics was the 'first philosophy', not in the sense that it was what came first in a sequential process, but that it lay deepest – probing the very nature of the cosmos – and was therefore in fact the *last*, temporally speaking, in the process. All other knowledge led to this end: 'the person

who studies it', wrote the philosopher RG Collingwood, 'will be doing what in all his previous work he was preparing himself to do.'⁴² Science is not just a technique, but, rightly conceived, the groundwork for illuminating something lying beyond itself. This is why philosophy needs science, and science needs philosophy. 'The First and Last Science is therefore the science of that which stands as ultimate logical ground to everything that is studied by any other science', continues Collingwood. 'The ordinary name for that which is the logical ground of everything else is God.'⁴³

WHY 'GOD'?

I can easily understand someone saying 'I can see why we need to go beyond what science can tell us. Very few people now believe that science can answer all our questions. And you have already suggested that metaphysics and science when properly understood sustain one another in different ways. But why bring God into it? God is no more an explanation of how things came about than the ground of Being. Where, after all, does God come from? We are still as ignorant. Theology gets us no further than philosophy.' I am sympathetic, particularly because the weight of history attached to the word makes it hazardous to invoke the word God.

It is perfectly true that invoking God does not *explain* anything. But, importantly, that is not its purpose. The recognition of God is not an answer to a question: it is to fully understand the question itself. In this spirit Wittgenstein wrote: 'To believe in a God means to understand the question about the meaning of life.' And he continued: 'To believe in a God means to see that the facts of the world are not the end of the matter. To believe in God means to see that life has a meaning.'⁴⁴ The point of invoking God is to ensure that we do not lose sight of the deepest of life's enigmas. 'When we speak of God', writes theologian Herbert McCabe, 'we do not clear up a puzzle; we draw attention to a mystery.'⁴⁵ When the word disappears from our vocabulary, we don't abolish that mystery; we just cease to recognise that it is there. We no longer know what it is we do not know. There is nothing shameful in not knowing: the human mind is inevitably characterised by its ignorance more than by its limited understanding. But the deeper ignorance is when we choose to put out of mind what it is we do not know, and pretend to know what we never can.

Yet the word God cannot easily be substituted *merely* by Being. That is immediately to substitute something else that has its own, more limited, meaning; whatever word we use, it must have no other referent whatsoever. To quote Plotinus: it refers to 'a nobler principle than any thing we know as Being; fuller and greater; above reason, mind and feeling; *conferring* these powers, not to be confounded with them.'⁴⁶ Moreover we have lost the sense of how mysterious Being in itself is. To some it is impossible to get beyond the view that 'is' is just a verbal copula. It is hard for us to awaken

ourselves again to the essential strangeness of existence – to recover, as Heidegger thought we must, the ‘radical astonishment’ of being.⁴⁷ If such an idea means nothing to you, that could, indeed, be a rebuff to it; but it might be the best demonstration of the truth of Heidegger’s assertion that our problem is that we have lost sight of, forgotten – even forsaken – Being.⁴⁸

Being being a mystery, it is therefore better expressed as an object of awe than as an object of knowledge. Numerous philosophers, among them Plato and Aristotle, as well as Goethe and Heidegger, have been moved to observe that philosophy begins in wonder. It also often ends in wonder, as Goethe reflected, awe being a better gauge of one’s commerce with truth than certainty.⁴⁹ Similarly, Whitehead thought that, while ‘philosophy begins in wonder ... at the end, when philosophic thought has done its best, the wonder remains.’⁵⁰ According to Josef Pieper, wonder is not just what initiates, but what sustains philosophy. He calls wonder ‘the abiding, ever-intrinsic origin of philosophizing. It is not true to say that the philosopher ... ever “emerges from his wonder” – if he *does* depart from his state of wonder, he has ceased philosophizing.’⁵¹ Knowing does not dispel awe, though ignorance can banish it.

That awe and wonder are the end as well as the beginning of philosophy is one reason why God may be a better name than just ‘the ground of Being’ for this creative mystery. A phrase like ‘the Ground of Being’, too, may have its conventional, cultural baggage – in this case, its presumed dullness. It could serve only as long as we see Being as having already something unfathomable about it – somewhat of the nature of God. But that is precisely what modern Western culture does not entertain.

So, providing we remain appropriately sceptical about language, we not only *can* use a term other than ground of Being, but, it seems to me, we *must*. Metaphysical argument can take us some of the way, but it deals only with the what, not the how. Even the rather abstract question ‘why should there be anything at all?’ is not, after all, just an intellectual puzzle. It is a fundamental question – *the* fundamental question – for human beings; and we miss the point if we suppose that it is a matter for abstract reasoning alone.

In a wonderful passage Schelling writes about how we should prepare ourselves for an understanding of any subject:

First and foremost, any explanation should do justice to what is to be explained, not devalue it, explain it 'away', diminish it or mutilate it, simply so as to make it easier to grasp. The question is not 'what view must we adopt so as to explain the appearances in a way that accords neatly with some philosophy?', but precisely the opposite: 'what philosophy do we need if we are to measure up to our object, and be on a par with it?' It is not how the phenomenon must be turned, twisted, skewed or stunted, if need be, so as to be explicable according to principles which we have already resolved never to go beyond. The question is 'in what way must we broaden our thinking so as to get a hold on the phenomenon?'

And he goes on:

But he who refuses, for whatever reason, to broaden his thinking in this way should at least be honest enough to count the phenomenon amongst those things (which, when all's said and done, are for all of us plenty enough) that he does not understand; rather than drag it down and degrade it to the level of his own conceptions; and, if he is incapable of raising himself up to the level of the phenomenon, at least to stop short of holding forth about it in wholly inadequate terms.⁵²

I believe that, in the necessary process of achieving a fit between our understanding and what there is to be known, our present materialist culture has disregarded Schelling's advice, and contracted the scope of what we allow to exist to our limited understanding, rather than enlarging our understanding to meet the scope of what exists. We are like someone who, having found a magnifying glass a revelation in dealing with pond life, insists on using it to gaze at the stars – and then solemnly declares that if only people in the past had had such a wonderful magnifying glass to look through, they'd have known that, on closer inspection, stars don't actually exist at all.

I want to emphasise that there is a distinction between something beyond our means of grasp and something beyond our means of knowing. To follow the *via negativa* is an intellectual process in which we recognise

the inadequacy of our conceptions of God, but it is not at all the same as just giving up hope of knowing God. Though we may approach a subject of knowledge apophatically, not by asserting what is the case but by seeing what is *not* the case, there will nonetheless be intimations, affirmative signs within the field of our unknowing, or we would not even be able to see that there is something there beyond our current knowing to know. The knowing is a process that knows no end.

It is argued that our knowledge of science, too, has an apophatic structure – and it does: approximating truth by stripping away falsehoods.⁵³ But in relation to the divine, unlike spacetime, there is also a realm of spiritual gnosis that does not apply to physics, since God is far more accessible to heart and soul than to intellect. Plotinus puts it, I think, exceptionally well:

We do not, it is true, grasp it by knowledge, but that does not mean that we are utterly void of it ... Those divinely possessed and inspired have at least the knowledge that they hold some greater thing within them though they cannot tell what it is; from the movements that stir them and the utterances that come from them they perceive the power, not themselves, that moves them ...⁵⁴

Take those ‘placeholder’ terms – *logos*, *li*, *tao*, *ṛta*, and so on. The place they hold is not nearly filled by the mere idea of a ground of Being. They suggest much more: a response to the second question with which this chapter began – why does Being take the creative, complex, orderly, beautiful, intelligible – *vital* – form that it does? And, though arising in different cultures, what they suggest is remarkably consonant. They suggest a co-ordinating principle in the universe which is evidenced in order, harmony and fittingness; a principle that is not only true, but the ultimate source of truth. This principle applies to all ‘levels’ of existence and therefore wraps within itself the human soul. Speaking of *ṛta*, for instance, Raimon Panikkar writes that it can be seen as the order behind the manifest world, the harmony among all aspects of manifestation, ‘each of which obeys its own level’. *Ṛta* is in the nature of things: ‘Man being an aspect and expression of this order has within him a reflection thereof’.⁵⁵

The point is that we are engaged with it through the whole experience of being alive: through our way of meeting the world not just in the intellect but in the heart and mind. It engages us in the form of a question that is so much more than the kind inviting a merely analytic reply: the question ‘what does it mean to be alive?’

The consequence of speaking about God rather than merely about the ground of Being is not only that it keeps in our field of attention the ineffable mystery of existence, as McCabe points out – that to which Heidegger exhorts us to respond with radical astonishment; it also alerts us to the inadequacy of a response couched primarily in terms of propositions parried back and forth in the cut and thrust of argument. What the term ‘God’ requires of us is not a set of propositions about what cannot be known but a disposition towards what must be recognised as beyond human comprehension. The primary response, therefore, is not intellectual. It is awe and wonder – not mere curiosity, which motivates us to find out more information, more knowledge (valuable as that is), but wonder at the immensity of what we must recognise we can never know. Yet that very wonder is what increasingly we lack.

‘As civilization advances, the sense of wonder declines’, wrote Abraham Heschel:

Such decline is an alarming symptom of our state of mind. Mankind will not perish for want of information; but only for want of appreciation. The beginning of our happiness lies in the understanding that life without wonder is not worth living. What we lack is not a will to believe but a will to wonder. Awareness of the divine begins with wonder. It is the result of what man does with his higher incomprehension. The greatest hindrance to such awareness is our adjustment to conventional notions, to mental clichés. Wonder or radical amazement, the state of maladjustment to words and notions, is therefore a prerequisite for an authentic awareness of that which is.⁵⁶

A DISPOSITION TOWARDS THE DIVINE: SUSPENDING THE LEFT HEMISPHERE

Heschel's terms will ring bells for readers who have followed the hemisphere hypothesis that underlies this book. 'Conventional notions' and 'mental clichés' are exactly what are produced when the left hemisphere takes on the role of master and believes in the sufficiency of its representations of reality, when it traps us in a hall of mirrors of its own creation, and tells us that's all there is. Equally, 'higher incomprehension' is a grand way of speaking of the right hemisphere's openness to what it doesn't already know, which it can't (in any conventional way) make sense of, but whose reality it intuits and does not deny. It will come as no surprise, then, that a disposition towards God is largely dependent on the right hemisphere, the hemisphere that we already know brings us closer to truth than the left. (I explore the evidence for significant right hemisphere dependency in Appendix 7.)

But, before we look further at this disposition, it's worth noting where we've got to and how we have got here. We've reached the point, in this discussion, where the left hemisphere can do no more for us – at least, not for the time being. We're faced with the unavoidable fact of the existence of the ground of Being (whatever we may choose to call it) and of the fact that we cannot treat it as we treat manifestations of Being itself: that's to say, manifestations of which the left hemisphere can make re-presentations so that we may control them. Going beyond mere acknowledgment of the ground of Being's existence to see what is 'there', so to speak, is beyond the left hemisphere's capacity.

But here's the thing: note that it is the left hemisphere and its reasoning processes that have brought us to this point, the point at which its own limitations become evident. Put another way, the left hemisphere as servant has provided a vital role: drawing attention to the limits of its service. You have to be able to think clearly in order to see that there are limits on thinking. Here we may recall Pascal: 'the ultimate achievement of reason is to recognize that there is an infinity of things which surpass it. It is indeed feeble if it can't get as far as understanding that.'⁵⁷ And although the left hemisphere cannot do more for us now, I shall argue that its service will be

needed again once the right hemisphere has done its work of gleaning ‘an authentic awareness of that which is’ by means of a necessary ‘maladjustment to words and notions’ (in Heschel’s marvellous phrase). Thereafter the helpful left hemisphere will be useful again but it will need to keep to its place: as servant it will be invaluable, but as master it will be disastrous.

As far as humanity is concerned, the summit of knowing is knowing that you do not know. Such was the expressed conclusion of, to name only a few, the Buddha, Confucius, Socrates, St Paul, Montaigne and the Indian saint, Swami Ramdas. Wisdom is so far from being knowledge in the usual sense, of knowing many ‘things’, that one of the only pieces of advice offered by wisdom traditions is to value not-knowing.

Not-knowing, however, is not the same as ignorance: it is what is left before us when ignorance is left behind. There is ignorance prior to knowledge, and there is not-knowing, once knowledge has been outlived. The essence is encapsulated in a remark attributed to ‘a Master’ by the poet Charles Wright: ‘for knowledge, add; for wisdom, take away’.⁵⁸

In an earlier chapter I alluded to the form of the spiral, as opposed to the circle: arriving where you started from, in one sense, and yet knowing it for the first time. As there is an un-knowing the other side of knowing, which is far superior to both knowing and ignorance, there is an innocence the other side of experience, which is superior both to experience and naivety; and a wisdom the other side of folly, which is superior both to folly and common sense. This insight lies behind the well-known Zen saying, sometimes attributed to Dōgen: ‘Before I sought enlightenment, the mountains were mountains and the rivers were rivers. While I sought enlightenment, the mountains were not mountains and the rivers were not rivers. After I attained enlightenment, the mountains were mountains and the rivers were rivers.’

More down to earth, perhaps, but no less worth listening to, is Thoreau. ‘It is only when we forget all our learning that we begin to know’, he writes:

I do not get nearer by a hair’s breadth to any natural object so long as I presume that I have an introduction to it from some learned man. To conceive of it with a total apprehension I must for the thousandth time approach it as something totally strange. If you

would make acquaintance with the ferns you must forget your botany. You must get rid of what is commonly called *knowledge* of them. Not a single scientific term or distinction is the least to the purpose, for you would fain perceive something, and you must approach the object totally unprejudiced. You must be aware that *no thing* is what you have taken it to be. In what book is this world and its beauty described? Who has plotted the steps toward the discovery of beauty? You have got to be in a different state from common. Your greatest success will be simply to perceive that such things are, and you will have no communication to make to the Royal Society.⁵⁹

This allowing something to ‘presence’ is surprisingly hard for us, since as Evelyn Underhill put it, for us the ‘haze of reality is always ready-jugged’. It involves eschewing knowledge *about*, in order to have knowledge *of*, something; the relinquishing of serial processes that claim to help us understand, in order that we can see the thing at once; the abjuring of the need to narrow down or fix one’s object.

In the *Diamond Sutra*, it is said that knowing is seeing, but seeing is not knowing.⁶⁰ By this I understand that true knowing, *understanding*, is not a matter of accumulating facts, but a form of perception in which one at last sees into the depth of things as it were ‘at once’, and recognises them for what they are, no longer overlaid by our projections – something like the process described by Thoreau. At last we *see* them. At the same time seeing things in the normal sense, of resting our eyes on their surface, is not to know them at all. This distinction also lies behind Josef Pieper’s remark that in the modern age ‘man’s ability to see is in decline.’⁶¹

The idea of unknowing may sound – well, negative. But it is the secret to the greatest creative power. ‘To know truth, one must get rid of knowledge’, said Lao Tzu: ‘nothing is more powerful and creative than emptiness, from which men shrink.’ This emptiness goes well beyond our normal understanding, because there is an emptiness, a ‘nothing’, a living ‘nothing’ very different from what we generally now think of as nothing (which is dead), a *no thing on the other side of something*. I have mentioned the Buddhist concept of emptiness, or *śūnyatā*: like a receptive womb there needs to be a place for the new understanding, the new wisdom to grow. Fullness is where there is no room for anything to grow. And since

everything is a growing and becoming, and nothing that exists is *not* growing and becoming – when there is no room to grow there *is*, in that fullness, truly nothing.

When our assumptions flood in to the available space, they drive out the new before it has a chance to take root. We must first say ‘no’ to the *obvious*, that which stands in the way; we must get Underhill’s limpet off the rock. Saying ‘yes’ depends on something to say ‘yes’ to, but whatever it is has not yet come into being. We therefore say ‘no’ to what is already known. Thus, in creation, ‘no’ comes first.

At this point we must suspend the action of the left hemisphere, for it would at once try to see all this as a matter of propositional knowledge – and ultimately that is not to be dismissed, since the existence of a divine or sacred realm is not contrary to reason: it’s just that at this stage the left hemisphere is not up to doing the intuiting in the first place. The right hemisphere, however, *is* better capable of engaging with this whatever-it-is as something experienced and lived; as something relational, and reciprocal, in nature. It starts with the advantage that it ‘believes’, so to speak, that there is a ‘whatever-it-is’ out there with which to engage. ‘Belief’ is not a matter of coming to terms with arcane propositions, but nothing other than a disposition towards the world *as if God exists*, in order to open the *possibility* of an encounter with whatever the word ‘God’ designates. And it is *only* through the encounter that we can know – not through argument, or any amount of thinking in the abstract. One can sit on the brink for a lifetime waiting to learn how to swim, but without getting into the water one can never learn to swim at all. ‘Seek not to understand so that you may believe’, wrote St Augustine, ‘but to believe so that you may understand.’⁶² Without having sincerely made that attempt, it is impossible for anyone to know what it is they are denying. To say ‘it’s obviously not true’ is to make a mistake at the very first step.

There are *prima facie* reasons to suppose that an understanding of the divine is sustained largely by the right hemisphere. In metaphysical terms, it requires being open to something ‘Other’, something not already familiar, not part of the self-consistent system in which one operates; not ignoring – or simply not seeing – whatever does not fit the accepted paradigm. As Wendell Berry writes, ‘the incompleteness of a system is rarely if ever perceptible to those who made it or to those who benefit from it’.⁶³ The left hemisphere is effectively a closed system, dealing with the comfortably

known and familiar, in which everything refers internally. Adopting this mindset makes it hard to ‘see’ what is meant by the divine. To bring things closer to our age, there is a partial parallel in computer programming called the Blub paradox. This indicates that a programmer who is accustomed to using a certain language (call it ‘Blub’) will realise its comparative strengths, but will be blind to its weaknesses. This is because writing in a language means thinking in that language: typically, according to computer scientist Paul Graham, programmers are ‘satisfied with whatever language they happen to use, because it dictates the way they think about programs.’⁶⁴

This should immediately alert us to a problem, since by common consent no adequate language for God exists. Hence the conviction that religious thinking is delusional. ‘The habit of religion will always be derided by the atheist as an exercise in ever-increasing self-deception’, writes Jonathan Gaisman, in an essay called ‘The devout sceptic’, which I recommend. ‘Of course, precisely the same can be said about the habit of seeing the world in purely materialist terms. All mental habits lead – as is obvious – to habituation.’⁶⁵

The right hemisphere is better at accepting uncertainty and limits to knowledge. An understanding of the divine must rely on indirect and metaphorical expression, not direct and literal expression; it must tolerate ambiguity; and it has to be at ease with accepting that both of what, on the surface, appear to be contradictory elements might be true – in other words, it must be receptive to what we call paradox. It must see continuous processes, rather than a succession of isolated events, a process of becoming, not simply the fact of being; it must be able to apprehend ‘betweenness’, a web of relationships, not just an assemblage of entities – and that what is of primary importance in the web is the relationships, not the entities related. It involves appreciating a *Gestalt*, not a construction of parts; entering into an ‘I–Thou’, not just an ‘I–It’ relationship, with its subject; sustaining emotional depth; and seeing that spirit and body are not distinct, or opposed, but discernibly different aspects of the same being. In epistemological terms, it requires knowing in the sense of *kennen* more than *wissen*; valuing ‘active receptivity’, as well as *not* doing and *not* knowing. It involves sustaining attention, and stilling the inner voice, as in prayer and meditation. In ethical terms, it places a value on empathy; on the consensual rather than individualistic self; and on vulnerability. It must recognise, not

deny, the dark side to human consciousness, and be capable of understanding that good may, despite everything, emerge from suffering.⁶⁶ All of this (as only the reader who has accompanied me so far through the book will understand) in one way or another and to some degree suggests that the right hemisphere will play the key role. In this it is not different from other areas of life, since the proper relationship is always that of Master and emissary.

It may seem odd to cite the mediaeval mystic Meister Eckhart in support of an association between what we now know to be the right hemisphere and the approach to the divine; but, like James and Bergson so many centuries later, he seems to have intuited a distinction between two modes of understanding, one of which is more skilful here than the other. Consider these quotes from Eckhart in the light of what we have learnt:

The active intellect [LH] ... cannot entertain two images together, it has first one and then the other. [But] ... if God prompts you to a good deed ... whatever good you can do takes shape and presents itself to you together in a flash [RH], concentrated in a single point.⁶⁷

Here he could be seen as contrasting the serial concatenations of the left hemisphere with the immediate intuitive *Gestalt* formation more characteristic of the right.

Then he says: 'When the intellect discerns true being it descends on it, comes to rest on it, pronouncing its intellectual word about the object it has seized on [LH].' But, says Eckhart, it can never do what it longs to do, namely to say 'this is this, it is such and not otherwise'. It carries on in 'questioning and expectation; it does not settle down or rest, but labours on, seeking, expecting and rejecting ... Thus there is no way man can know what God *is*. But one thing he does know: what God is *not*. And this a man of intellect will reject.'⁶⁸ Eckhart seems to be telling us that the left hemisphere is unhappy until it can put words to experience and say with certainty what it is. While it can never succeed in this, it might have acquired an understanding by apophasis; but it can't understand that, and rejects the apophatic path.

Another passage bears comparison:

Intellect peeps in and ransacks every corner of the Godhead, and seizes on the Son in the Father's heart and in the ground, and sets him in its own ground. Intellect forces its way in, dissatisfied with wisdom or goodness or truth or God Himself. In very truth, it is as little satisfied with God as with a stone or a tree. It never rests ...⁶⁹

The 'intellect' (aka the left hemisphere here) is intrusive, overbearing, disrespectful, appropriative, insatiable, relentlessly striving and wilfully going about its business. And note the suggestions of curiosity rather than wonder: it peeps in, ransacks, seizes, forces its way in, is never satisfied, never resting ... it treats the divine according to its own conceptions ('sets him in its own ground'), and as a thing alongside other things, something commensurate with a stone or a tree. When it *does* see God, it doesn't recognise the fact, but goes on with its rampaging.

It is not surprising that Eckhart tried to image the opposite of this as *undoing*, *unknowing*, *unsaying*, darkness, emptiness and silence – something like the 'fertile night' that Chargaff referred to. (The owl of Minerva flies at dusk. Notice that the leaders of the Enlightenment called themselves '*les lumières*', and the leaders of the attack on religion judge themselves to be the 'Brights': as Chargaff pointed out, the brighter the light, the less you see; and as Suzuki noted, 'this "don't know" is what we call "dark", and it is very important'.) We switch out the light in order to see the stars. In one sermon Eckhart expands on the meaning of darkness. 'You cannot do better than to place yourself in darkness and unknowing', he says; and he imagines a bystander asking him: 'But what is this darkness and unknowing? And what is its name?' To this he replies: 'I can only call it a loving and open receptiveness, which however in no way lacks being: it is a receptive potential by means of which all is accomplished.'⁷⁰ This suggests the fertility of union between a creative principle and a receptive womb-like space (female principle) in which something is to grow.

In other words the darkness is not merely negative, but the active opening of a field of potential, what I have called *active receptivity*: the mode of the right hemisphere's attention.

In another passage Eckhart seems to distinguish two necessary modes of consciousness, one directed upwards towards the divine, the other obscuring reality by its representations of it in images and words:

The soul has something in her, a spark of intellect, that never dies; and in this spark, and at the apex of the mind we place the ‘image’ [*bilde*] of the soul. But there is also in our soul a knowing directed towards externals, the sensible and rational perception which operates in images [*glîchnisse*] and words to obscure this from us.⁷¹

Elsewhere, he warns us of re-presentations, the left hemisphere’s stock in trade: eg, ‘God is not seen except where he is seen spiritually, free of all images [*glîchnisse*].’⁷²

The personal accounts of Jill Bolte Taylor and Steve McKinnell, both of whom experienced a left hemisphere stroke, reveal that they felt an increase in spirituality, a new interest in meditation and an increased feeling of empathy following their stroke: according to Taylor, if she had to pick one word to describe the intent of her right hemisphere, she ‘would have to choose *compassion*.’⁷³

Looking more closely at religious practices, we see this pattern demonstrated vividly. Music is very largely right hemisphere-dependent.⁷⁴ So, it seems is meditation, especially the kind known as mindfulness meditation. Bhante Henepola Gunaratana, a Bhuddist monk who is an acknowledged master of meditation and mindfulness, writes in a classic text on mindfulness practice (I have italicised and numbered the more than 20 phrases that, with remarkable specificity in many cases, differentiate hemisphere styles of awareness):

Before you first become aware of something, there is a fleeting instant of *pure awareness just before you conceptualize the thing* [1], *before you identify* [2] it ... you experience a softly *flowing* [3] moment of pure experience that is *interlocked with the rest of reality, not separate from it* [4]. Mindfulness is very much like what you see with your *peripheral vision* [5] *as opposed to the hard focus* [6] *of normal or central vision*. Yet this moment of soft, unfocused, awareness contains a *very deep* [7] *sort of knowing that is lost as soon as you focus your mind* [8] and *objectify* [9] *the object into a thing* [10] ... It stays forever in the present, *perpetually on the crest of the ongoing wave of passing time* [11] ... Mindfulness is *participatory observation* [12]. The meditator is both *participant*

*and observer at one and the same time [13] ... Mindfulness is not an intellectual awareness [14]. It is just awareness. The mirror-thought metaphor breaks down [15] here. It is objective, but it is not cold or unfeeling [16]. It is the wakeful experience of life [17], an alert participation in the ongoing process [18] of living ... Mindfulness is a process, but it does not take place in steps [19] ... it does not categorise [20] ... it does not aim [21] at anything ... you can't develop mindfulness by force [22]. Active teeth gritting willpower won't do you any good at all. As a matter of fact, it will hinder progress [23] ...*⁷⁵

The relation of this strong phenomenological account with, principally, the right hemisphere is borne out by a range of neuroimaging studies, an account of which can be found in Appendix 7. Spiritual practices such as meditation are designed purposely to transcend typical left hemisphere reactions to perceived events: in the tradition of such practices the fact that verbal, analytical thought is antithetical is often expressed in the form of a warning.⁷⁶

WHAT IS IT LIKE?

So many things that are very real cannot be conveyed by language; and if they can't even be put into words, how can they possibly be argued about in a way that helps determine meaning? Ideas, the native currency of the left hemisphere, can be discussed at arm's length; direct awareness, the native currency of the right, has no arm's length about it: it is immediate in experience. It's where we finally get into the water and learn to swim.

Communication of such direct awareness can only be an account of personal experience: in recognition of this, I shall do my best to provide some indication of my own. Though I am someone whose left hemisphere, as the reader may have noticed, is far from inactive, I can attest that certain kinds of direct experience, unmediated by reflection, have been for me the undoubted wellspring from which life draws its meaning. So here I will briefly suspend my usual mode of discourse so far in this book, and attempt to provide a brief account of such direct engagement with what, both then and now, seems to me of the utmost importance.

Perhaps I should start by saying that neither of my parents, and none of my grandparents, was at all religious – rather the opposite. They did not take me to church, and, nearing the end of my life, I still don't attend one. Am I a religious person? Not in a conventional sense, then. Yet in a sense that is as important to me as it is hard to express, I surely am. I didn't get there by believing propositions, but from experience. And don't imagine that what I mean by experience is anything *outré* or supernatural. No visions or voices. It has all been entirely, quintessentially, natural – starting indeed from Nature herself.

It struck me from an early age that there was more going on than my senses were able to encompass: that nothing 'super' needed to be added to the 'natural' for it to invoke wonder. I suspect that if you rigorously disattend to that intuition, it will sooner or later go away. However I did not, and it didn't. It seemed to me that there was something 'beyond', in some sense, that drew me forward; something I had intuitive acquaintance with but could say almost nothing about, except that it seemed both real and beautiful. Later I discovered that it was akin to the feeling of being in love, a yearning for something that can only ever be known in part, but given as

much in the *process* of discovery as in the never-completed discovery itself. I felt that the world, and especially the natural world, was far from inert and unresponsive, but rather that I was already deeply connected to something inconceivably great, awe-inspiring and vivifying. I saw it in landscapes of hills and fields, in the cliffs and the sea, in the light of day-skies and the stars at night; in the flowing of streams, and the life of living creatures. In fact it seemed to me that Nature in all her forms, including those we call inanimate, was alive. I contrasted what I experienced with what I knew – or thought I knew: and I could only shake my head in disbelief at what my culture was teaching me to think.

Intellectual debate in the culture in which I grew up seemed dominated by what all my life has seemed to me a terribly impoverished philosophy, that of reductive materialism – just one model among many, and an outlier in the history of humanity; and this formed the starkest possible contrast with the world I encountered, not just in Nature, but in music, poetry and painting; and friendship, and, later, in love. At age 13, my first hearing of Tallis's *Lamentations*, of Beethoven's late piano sonata in A flat major, and Schubert's C major quintet, were each like an epiphany. As I explored the music of Tallis's contemporaries in England and across Europe, and the other late sonatas and quartets of Beethoven, Mozart's chamber music and the last sonatas of Schubert, I knew without question that the world was far greater, and far more mysterious, than the schema of it I was being offered by the popular voice of science. I still cannot describe such great works in terms other than those of the sacred and the ensouled.

At the same time I was reading poets avidly, especially Donne, Herbert and their contemporaries; I discovered the poetry of John Clare, not a religious poet in any explicit sense, but a delighted and awestruck observer of Nature, and Gerard Manley Hopkins. Another epiphany – I can specify exactly when and where it occurred – was the moment I heard read, as if *for the first time*, a poem (I thought of as) long familiar to me, Wordsworth's Tintern Abbey ode – one indeed that as a teenager I had learnt by heart: it induced a transfiguration of the accustomed world, and signalled the beginning of a lifetime's devotion to the poet.⁷⁷ From every side I saw how clearly the edifice of Western civilisation – its literature, its poetry, its architecture, its painting, its music – at all times and in all ages was to a large extent an expression of a spiritual impulse.⁷⁸ And one we have largely lost.

As the reader may well point out, it has surely also been an expression of *eros*. And I concur wholeheartedly. The celebration of *eros*, the force of life itself, is often a celebration of the sacred – Sappho’s lyrics and Petrarch’s sonnets, for example, come immediately to mind. Indeed erotic love may be the closest that many of us in our secular age get to experiencing the sense of something sacred.⁷⁹ To compare the spiritual and the erotic is not to denigrate the soul, but to recognise what erotic love can be: while clearly distinct phenomena, they have common facets, not least of which being their capacity to induce awe, to transform one’s vision of the world, and to forge a sense of connexion to something much greater beyond both space and time. Some may be inclined to be cynical here, but I think those who have experienced what I mean will understand. Plato was right to conceive our longing for communion with whatever is real as an expression of the impulse of *eros*.

What underlies and unites all these aspects of experience for me is the conviction of a direct and reciprocal engagement with whatever-it-is that is the ground of Being, and which we call God. I know of no better description of such direct experience and of the conviction it elicits than Wordsworth’s:

A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man:
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through all things.⁸⁰

In summary, my religious disposition, if that indeed is what it is, has resulted from a largely private lifelong exploration of the experience of being alive, guided by meditative reading of the spiritual texts of different cultures, experiencing holy places in different lands, encounters with human beings who seemed to me to be deeply spiritual people, sporadic attendance at rituals of great beauty, a lifelong celebration of art, and poetry, but of

music above all; and love; and long communing with the astonishing beauty of the natural world.⁸¹ All this, coupled to an abiding sense – intensified in proportion as I came to understand more – of how very little we can possibly hope to understand of all that exists.

Over my lifetime, I have repeatedly and increasingly become aware of the way in which such direct experience is vulnerable to diminution and dismissal in the light of the limited vision of the left hemisphere. This was in part the motivation for writing my first book, *Against Criticism*, and, in a sense, of my change of career to medicine; and of whatever has followed from it.

For those who have hung on to the reality of direct experience, and not let it become overshadowed by a representation that has none of its living qualities, we should reclaim the word ‘expert’ – literally, one who has experienced. According to the accounts of such experts, this vision is transformative. It induces, their example tells us, a humility before the greatness of the cosmos, and how little we understand it; compassion for others and ourselves; and reverence towards the living world. It allows us to acknowledge that there is something way before, behind, above, and beyond our selves; that that something is not inert or remote, but ‘speaks’ to us and calls to us to respond, and that we feel the need to do so with seriousness, reverence and gratitude. And that is what gives meaning to life.

In short, creation and the mystery of what lies behind it become *sacred*; and the disposition that sees it thus is what is meant by a religious disposition. It is a disposition that perceives depth. Except where such a religious disposition becomes perverted, as all too often it does (as I shall explain shortly), it is the exact opposite of the disposition towards creation of the left hemisphere, which sees itself as master – detached, confident, domineering, wanting to have control over creation and either disregarding the mystery of Being or recruiting it to its own purposes. That, unhappily, is the disposition that dominates our world, now, and not only any longer in the West alone.

More than 60 years ago, Tillich already reflected that

modern man is neither more pious nor more impious than man in any other period. The loss of the dimension of depth is caused by the relation of man to his world and to himself in our period, the period in which nature is being subjected scientifically and

technically to the control of man. In this period, life in the 'dimension of depth' is replaced by life in the horizontal dimension. The driving forces of the industrial society of which we are a part go ahead horizontally and not vertically ... He transforms everything he encounters into a tool: and in doing so he himself becomes a tool. But if he asks, a tool for what, there is no answer ...⁸²

Our view, says Tillich, has become superficial, lacking in depth, all on one plane. In Chapter 2 we saw that this loss of depth in time, in space, in emotion, and in understanding is one consequence of right hemisphere suppression. Our take on the world has become, Tillich says, that of instrumentalism, of transforming everything into a tool: the main characteristic of the left hemisphere. And we end by instrumentalising ourselves, for a purpose unknown.

He continues:

If the dimension of depth is lost, the symbols in which life in this dimension has expressed itself must also disappear. I am speaking of the great symbols of the historical religions in our Western world, of Judaism and Christianity. The reason that the religious symbols became lost is not primarily scientific criticism, but it is a complete misunderstanding of their meaning ... The first step toward the non-religion of the Western world was made by religion itself. When it defended its great symbols, not as symbols, but as literal stories, it had already lost the battle ... If the symbol of the Fall of Man, which points to the tragic estrangement of man and his world from their true being is transferred to the horizontal plane, it becomes a story of a human couple a few thousand years ago in what is now present-day Iraq. One of the most profound psychological descriptions of the general human predicament becomes an absurdity on the horizontal plane ...⁸³

Yet there never was a time in which the story of the Fall seems more pertinent – indeed prophetic.

RELIGION

I may have given the impression that the sense of the sacred is something isolated within the person, if not within the mind, and at the same time that it is purely transcendent of time and place. Yet as well as personal, the sense of the sacred is inevitably shared and communal; as well as being an inner realisation, it is realised externally in the visible, tangible, world; as well as being transcendent, it is immanent, having to do with the thisness of things in time and place, not just with abstract generalities. That is why there is not just my disposition or your disposition, but such a thing as religion.

What, though, is religion? Religion, as James points out at the start of *The Varieties of Religious Experience*, means so many things. However, there are common elements we can point to.

The principal way in which humanity has felt compelled both to express a sense of, and to make contact with, the divine is through music. And in this it seems to me that it has succeeded so immediately and so indubitably that language is scarcely needed. Both abstract and at the same time deeply, powerfully, wholly, embodied; both timeless and situated in time; both personal and universal; both particular and beyond all particularity; taking us into realms that declare themselves despite being utterly beyond language. Music unifies these apparent contraries. And it is also a feature of music in every known culture that it is used to communicate with whatever is by definition above, beyond, ‘Other than’, ourselves.⁸⁴ It forms the bridge: that between human and divine, and that between human and fellow human, and is at the heart of religious worship everywhere. Music exists entirely in the betweenness of tones; and religion exists – or rightly understood exists – in the betweenness of human beings, out of which, as with musical notes, something far greater than the sum of its parts emerges.

Many misunderstandings of spiritual and religious teachings come from a narrow adherence to the view that language, if sufficiently carefully analysed, will reveal truths. There is wisdom in lines from the ninth-century Chinese poem, *Bǎojìng Sānmèi*, considered one of the masterpieces of Zen literature: ‘The meaning is not in the words, but it responds to the inquiring impulse’.⁸⁵

Religion, at its best, is a cultural expression of that enquiring impulse; of an awareness of and openness to a God or gods; of a context that transforms our understanding of the world, and which enables this sense to be shared and celebrated with others; in other words, it involves community, in space, but also over time. Indeed, it helps to bind a community together: that is what religion means (from Latin *religare*, to bind). It makes tangible the betweenness, the relational nature of existence. And in this respect, if no other, it is hard to replace. What there is to be known is reciprocally bound up with the way that we attempt to know it, something science generally glosses over. The way we choose to attempt to know anything has moral implications, a point I have repeatedly emphasised. The myths of religions convey truths that are absent from everyday thought and language, and speak directly to us at the deepest level of our understanding of life itself.

Secular gatherings, by contrast, do not remind us of what our lives mean *sub specie æternitatis*, but merely confirm further our everyday views. This probably explains the enduring desire for religious ceremonies of birth, marriage and death among those who are not regular attenders at a place of worship.⁸⁶ In fact one of the reasons for having religion is constantly to remind us of a broader context; a moral order; a network of obligations to other humans, to the earth, and to the Other that lies beyond. Extending beyond our lives, that is, in space and time, yet rooted firmly in places, spaces, practices, here and now. A religion forms the bridge between worlds, which is the purpose of metaphor – and the purpose of ritual, which is metaphor embodied. One of the beautiful things about many religions, especially perhaps Hinduism, but also certainly in some traditions within the monotheistic religions – those I know of include Eastern (so-called Orthodox) Christianity, and Judaism – is that there are brief prayers of only a sentence or so, gestures, beautiful small rituals, that sanctify the familiar routine actions of daily life, and set them within the perspective of the infinite, of which we so easily lose sight. And inculcate a habit of reverence and gratitude towards the world: of seeing the sacred in every part of what is given.

I earlier referred to Confucius' advice that a ruler needs weapons, food and, above all, trust, in order of ascending importance. As if to confirm this, in commenting on prehistoric sacred rituals, archaeologist Clive Gamble comments that beliefs could not have been

something special and separate, but an integral part of social life, pervading all activities ... I think that belief systems at this stage could have been almost as important as having enough people to defend your territory, or even controlling a food supply: because shared beliefs would have allowed people to connect across social universes much larger than the local social group.⁸⁷

Trust depends on shared beliefs; religion is the manifestation of that trust, and the embedding of it into the fabric of daily life. Religion embodies awareness of God in the world through deeply resonant myths, narratives and symbols, enacted in rituals, conducted in holy places, that parallel the cyclical passage of time. In doing so it exists as a repository of the accumulated wisdom of good men and women, so that each living being does not have to ‘re-invent the wheel’ but can benefit from common insights. While religions differ, particularly in their more superficial representations, their insights are for the main part congruent across time and across the world, a sort of ‘perennial philosophy’. A religious life expresses, as I have suggested, a *disposition* towards the world that has consistently the same qualities: humility, compassion, reverence. Of James, Jonathan Rée writes:

The cynicism of modern atheists was as alien to him as the gullibility of traditional believers. Religion, as far as he was concerned, meant regarding the world with reticence, tenderness and love, and in that sense he still regarded himself as religious.⁸⁸

It is the opposite of cynicism or trivialisation. Out of a religious disposition, at its best, arises a harmony between deeds and words, manifest in a certain way of being. It is an allegiance to certain values; a synthesis of rational beliefs with valuable intuitions; of faith with doubt. Since it is the disposition that matters, it cannot – as neither can virtue ethics – be identified with words alone, or deeds alone, or beliefs alone, though all these form a part. It is not just the ‘what’ of the parts, but the ‘how’ of the whole, that matters.

According to James, a religious disposition ‘favours gravity, not pertness’:

it says ‘hush’ to all vain chatter and smart wit ... There must be something solemn, serious, and tender about any attitude which we denominate religious ... The divine shall mean for us only such a primal reality as the individual feels impelled to respond to solemnly and gravely, and neither by a curse nor a jest.⁸⁹

Which is not at all to say, of course, that the religious person should abjure fun or humour. The point is about respect, something we’re not strong on these days. Wisdom is often closely allied to humour, a truth enshrined in Zen Buddhism and Sufi stories, as well as in the Talmud, and it has its place: just not in the solemnities of ritual (if only we still remembered this simple fact – it’s once again the importance of context). James’s point is that religion prefers wisdom to cleverness. Our contemporary culture is not obviously well disposed towards gravity, the cessation of chatter, thoughtfulness, acknowledgment of the depth of our unknowing. It prefers cleverness to wisdom.

The way in which one equips oneself to understand religious truths is not – fairly obviously, but I’m afraid it still needs saying – by the scientific method. God is not a force in physics that we have not yet discovered. Propositional beliefs are what science has to offer. Yet propositional belief, while indisputably valuable, is the *least* that religion has to offer. Indeed we are not dealing primarily with propositions at all, certainly not with a simple body of propositions the truth of which could in principle be determined in the same way that the date of the Big Bang, or the number of bonds in a carbon atom, can be determined. Religion offers deep, imaginative archetypal truths about the human condition that cannot easily be expressed in any other way, never mind in the sort of prose you might expect in a science text book. And such truths are primarily experiential, although they may have cognitive aspects. In order to understand, you not only may, but *must*, try for yourself. Knowledge is of many kinds. Science is a matter of *wissen*, knowing facts; religion a matter of *kennen*, knowing by experience. (I am coming to believe that the limited nature, and many of the confusions, of the Anglo-American tradition in philosophy is in part due to the fact that in English we have only one word for ‘know’.) Science is – at least purports to be – purely a matter of cognition. Religion is about the whole business of human being, human existence. Cognition alone will not do for that. As

Wittgenstein saw, ‘even if all *possible* scientific questions be answered, the problems of life have still not been touched at all.’⁹⁰

To quote Jonathan Rée, ‘if there are religious truths, they are more like truths of love than truths of science: they depend on facts that will not come to pass unless we go half way to meet them.’⁹¹ On this point I cannot help thinking of a story told me by a Jewish friend. There was a very poor, but good, rabbi whose life would have been very much more comfortable if he had money; and so he prayed repeatedly to God: ‘Please just let me win the lottery’. And his prayer never seemed to be answered. One day he was at prayer as usual, when God said to him, ‘Look, Manny, meet me halfway: *buy a ticket*’. Understanding any spiritual truth depends on at least buying a ticket. Knowledge of this universe in which we live must be participatory. If you are not prepared to participate, or to take any risks, love will never be part of your life. Risk and vulnerability are of love’s essence. And love – as you will know if you have made the experiment and experienced it – opens aspects of reality that would otherwise be concealed from you.

Faith can never be certain: it follows that doubt is a necessary part of faith. Because of the prominence in news bulletins of religious fanaticism – something utterly different from what I’m talking about, and to which I’ll return – those who have never tried to find out more about religion imagine that doubt is the opposite of faith. It is rather its inalienable companion. Faith and doubt are a living dipole. Faith is neither certain nor blind, but a sense of allegiance born of experience.

It is significant that if you ask people, certainly in Britain, if they are religious, a large majority say they are not; if you ask people if they believe that there is more to reality than the realm of material things described by science, an even larger majority say that they do. I suspect that many of what I would see as the most honest kind of believers call themselves agnostic; they are quite understandably frightened away from God by the off-putting and sometimes thoroughly left hemisphere way in which religions these days in the West present themselves, having allowed themselves to stray from their origins into something that the left hemisphere, they believe, will surely understand. And by the idea that something called ‘blind faith’ is involved. There is nothing blind about faith, but there is nothing certain about it, either. It is like trusting the outstretched hand that helps you ford the stream: you see the stream, you see the hand; you do not blindly step, but step you must.

‘ONE MUST KNOW WHEN TO STOP’: RELIGION AND THE PROBLEM OF LANGUAGE

There are, of course, many religions. But one of the striking things about those religions with their different placeholder ‘un-words’ for the divine – *logos*, *lǐ*, *tao*, *ṛta* and so on – is that none of these ‘un-words’ suggests a thing, but always a process: a dynamic source of energy, often imaged as fire or water – or, at another level, as love and life. Though *ṛta* is the ultimate foundation of everything, ‘this is not to be understood in a static sense ... It is the expression of the primordial *dynamism* that is inherent in everything.’⁹² Like *lǐ*, like *logos*, and like the *tao*, it is creative energy, and it flows. God is a verb.⁹³ That these ‘un-words’ for the divine should share a conception of it as a process of flow is further evidence that it is the right hemisphere which, so to speak, divines the divine. Nothing more economically expresses the deep distinction between a view of the cosmos, on the one hand, as a specifiable assemblage of distinct entities (LH) and, on the other as an unnameable, undivided flow (RH), than this insight from the *Tao Te Ching*, warning us against division and the naming of parts:

The Tao is forever undefined ...
Once the whole is divided, the parts need names.
There are already enough names.

One must know when to stop.
Knowing when to stop averts trouble.
Tao in the world is like a river flowing home to the sea.⁹⁴

The left hemisphere never ‘knows when to stop’. And so we *do* use more than ‘enough names’ when trying to express a response to the divine – indeed the response almost excites linguistic extravagance – and the trouble is that those names are then taken to refer to distinct, individually analysable components of some sort of divine ‘system’. The words ‘God’, the ‘divine’, the ‘holy’ and the ‘sacred’, both in their origin and in their usage, have never been wholly separable, nor should they be, since they

refer to one coherent experience of the world and our response to it. They refer not to distinct *entities*, but to a *relationship*. And if one is willing to use the term sacred, or holy, one cannot do so without implying relationship with the divine. Blake uses such words interchangeably: what, however, we can be clear about is that when he says that all living things are holy, or that the human form is divine, he does not mean that they are merely beautiful, wonderfully intricate, or to be admired in some other way, but are part of an intrinsically divine cosmos.

This is not just another case of how thinking in terms of things leads us astray, but the ultimate case. The words designate not some unfamiliar thing to relate to, but a new relationship with the familiar, manifested throughout: an allegiance, which is what faith (from Latin, *fides*, as in ‘fidelity’) means.

Throughout I have contended that dynamic relationships are not only more important than the entities related, but odd as it must undoubtedly sound, ontologically prior to them – so that what we call ‘things’ arise out of the web of interconnectedness, not the web out of the things. This has long been my intuition, and recent advances in physics, to some of which I have adverted, seem to corroborate it at a different level (see Chapter 24). It also recalls the Vedic image of Indra’s net, which encompasses the universe, and in which all that exists is connexion; at each point of intersection there is a jewel, like the drops of dew on a spider’s web. In each jewel all the others are reflected, something akin to a hologram.

If there are, then, ‘already enough names’, if the divine is perceived as an unnameable, undivided flow, and if relationship to and within that flow marks the nature of the right hemisphere’s engagement with whatever-it-is that it perceives as divine, then it is to be expected that what religions *primarily* do in response should itself be consistent with the mode of the right hemisphere: they engage in acts of worship, ceremonies, rituals that celebrate the sacred. But human beings feel the need to speak about their experiences, and religions, being about collective, shared experience, feel the need to find a common language for that experience. So, despite the warning about ‘names’, religion cannot, unfortunately, escape the problem of language.

We saw, in previous chapters, that time as experienced cannot be represented and still be time; that space cannot be represented and still be space; that flow and motion cannot be represented and still be motion and flow. These elements are not further clarified by language, but rather

become something else in its clutches – a derogation of what can be known only through direct experience. Typically the left hemisphere deals with each of them, as it deals with everything, through representation; so, for us to gain a fuller understanding of any of them, involves reversing that process. We need to be liberated from our familiar *idea* of it, and allow whatever it is – time, space, or flow – to regain experiential depth. We must prize the limpet off the rock of the obvious. I have attempted to do that in some of the preceding chapters.

It is no different with God. Attempts to deal with the divine, not in experience, but in language other than poetry, too easily lead to the substitution of a re-presentation for a living experience – and are doomed.

We *must*, then, have recourse to metaphor, as the philosopher Paul Ricoeur makes clear: we have no other option.⁹⁵ To do so is not an evasion, as some atheists seem to believe, but the inevitable result of being aware of what one is dealing with. We have seen that, according to the philosopher Whitehead, philosophy is akin to poetry. And we have heard from Bohr that physics can be described only in language that has the nature of poetry: this does not render physics somehow unreal – rather the opposite. He was equally clear about the need for poetry in dealing with the divine. The fact that spiritual traditions through the ages have spoken in images, parables, and paradoxes, Bohr said, ‘means simply that there are no other ways of grasping the reality to which they refer. But that does not mean that it is not a genuine reality.’⁹⁶ If you are a biologist you can get by (while, nonetheless, mistaking the nature of what you deal with) in a comfortably familiar metaphysical world. Physicists, by contrast, spend much of their time grappling with the ultimate nature of reality, and must take in their stride the failures of analytic rationalising, classical mechanics and ordinary language. As a result, contemporary physicists often say things that the great wisdom traditions of the world have been declaring for thousands of years; and since one of the findings of contemporary physics is, indeed, that ‘inner’ and ‘outer’, consciousness and matter, are not separate, it is only to be expected that the truths they discover in the physical world will be in harmony with those disclosed in spiritual traditions. And so Bohr continued, dealing with another point sometimes made by opponents of such traditions, namely that there are differences between the ways in which those traditions express themselves:

I can quite understand why we cannot speak about the content of religion in an objectifying language. The fact that different religions try to express this content in quite distinct spiritual forms is no real objection. Perhaps we ought to look upon these different forms as complementary descriptions which, though they exclude one another, are needed to convey the rich possibilities following from man's relationship with the central Order ...⁹⁷

That is because what we are dealing with is not subject to being defined; it can be approached only tentatively through different analogical metaphors or myths, which *should*, if they are true, be various in nature, because a single, simple analogy can never be right. (There are, separately, problems in finding analogies of any kind whatsoever to something that is utterly *sui generis*).⁹⁸ The point is, the difficulty lies not in *finding* the right words: the difficulty lies in there *being* no right words, and so when we use words carefully we must always be both saying and un-saying.

Even poets, after all, struggle with the limitations of language. Rilke wrote wonderfully about this problem, how language destroys the immediacy of experience, how it neutralises awe, and even tries to encroach on the divine. For language, he says, no mountain is miraculous anymore; the 'garden and property' of language reach *right up* to the very border with God:

The words of men make me very afraid.
They make everything sound so terribly clear:
This is called 'dog', and that is called 'house',
And here's the beginning, and there is the end.

I fear their intentions, their playful sneers,
They know all that was and ever will be;
Now there's no mountain can fill them with awe;
Their estate reaches right to the border with God.

I want to resist them and shout: 'Keep away!
I so love to hear the singing of things.
You touch them – and they fall as silent as stone.

You're destroying the life of things for me'.⁹⁹

The single most dramatic demonstration of the inadequacy of prose to speak of the divine comes from the life of St Thomas Aquinas, by common consent one of the greatest of theologians that ever lived. His massive analytical work the *Summa theologiæ*, the most comprehensive account of the Christian faith ever written, is a masterpiece of scholarship and philosophical thought, and he is often spoken of in the same breath as Aristotle and Plato. On the 6 December 1273, the feast of St Nicholas of Myra, he had a mystical experience while saying mass, after which, having written at a furious pace without ceasing for 35 years, he decided he could not continue. His secretary Reginald of Piperno naturally urged him to resume. Aquinas replied:

I adjure you by the living almighty God, and by the faith you have in our order, and by the love you bear me, that you never reveal in my lifetime what I am about to tell you ... Everything that I have written seems to me like chaff compared to those things that I have seen and which have been revealed to me.¹⁰⁰

He stopped in the middle of Part III of the *Summa*, at the point where he happened to be writing about penance, and never wrote another word.¹⁰¹

It is not that language and rational thought here are not valuable: they are. But they are there to be struggled with, and finally, having been found wanting, let go. The struggle was not wasted effort. In Hegel's metaphor, the beauty of the bud is sacrificed, necessary as it was, once the flower comes into being; and still more the flower must be sacrificed once the fruit comes into being; yet each has its place, and all were valuable, as part of the greater creation as a whole. So words have their place, but only up to the borders with God.

And, beyond language, what is to be understood by the idea of God passes through a familiar process, that of unlearning what we thought we knew. Freeman Dyson describes the three stages whereby students come to terms with quantum mechanics. First they learn the 'tricks' – how to calculate and get the right answers – a trouble-free stage. Then they come to a painful awareness that they have no understanding of what they have been

doing, and feel confused and abashed. Then ‘unexpectedly, the third stage begins’:

The student suddenly says to himself, ‘I understand quantum mechanics’, or rather he says, ‘I understand now that there isn’t anything to be understood’. The difficulties which seemed so formidable have mysteriously vanished. What has happened is that he has learned to think directly and unconsciously in quantum-mechanical language. He is no longer trying to explain everything in terms of prequantum conceptions.¹⁰²

There is a clear parallel here with the attempt to understand the idea of God by the conventional terms of the left hemisphere: we can’t do it with ‘pre-quantum’ terms.

As Meister Eckhart says, ‘Since it is God’s nature not to be *like* anyone, we have to come to the state of being *nothing* in order to enter into the same nature that God is’.¹⁰³ Of those who no longer know enough to experience what Einstein called ‘rapturous amazement’, Bohr reportedly said: ‘Thinking they know things when they know only words, they will not know their ignorance and will never wonder.’¹⁰⁴ The space held open by words, in particular the un-word that is the divine name, must never be closed too tightly. Yet, paradoxically, without words we may, as a culture, if not as individuals, forget what everyday language obscures from our vision.

The thirteenth-century mystic, Marguerite Porete, in her book *Le Miroir des âmes simples et anéanties* – translated as *The Mirror of the Simple Souls Who Are Annihilated [and Remain Only in Will and Desire of Love]* – gives 12 ‘names’ for the soul, the last of which is *Oubli* (Forgetting). Our souls, she says, readily experience and understand the divine, but as readily let it pass from mind.¹⁰⁵ I believe it to be important that we recognise what has happened and aim to recover some of what we have lost. We need what Plato called *anamnesis* (unforgetting), or what Heidegger calls remembering of Being. There is no doubt that we are again in an area where language and reason are inadequate to the task, but that does not mean there is nothing to be conveyed. ‘Whoso is unable to follow this discourse’, said Meister Eckhart, ‘let him never mind. While he is not like this truth he shall not see my argument.’¹⁰⁶ In similar vein Plotinus said: ‘To any vision must

be brought an eye adapted to what is to be seen, and having some likeness to it. Never did eye see the sun unless it had first become sunlike.’¹⁰⁷ That might sound irritatingly like a rhetorical ploy, but I believe there is, nonetheless, clearly truth in it: we must meet things on their own terms, not our preconceived ones, if we are to see them at all. This is the point so beautifully made by Schelling above. Kolakowski puts it well, speaking of the contradiction apparent in saying that ‘God is ineffable’:

The adjective ‘concrete’ is abstract, the adjective ‘incommunicable’ is communicable, the adjective ‘unique’ is general, and to utter the word ‘intuition’ is not itself an act of intuition. We cannot get rid of the barriers of language when we try to convey to others something that language is intrinsically not designed to deal with; we can use it none the less to produce various hints, metaphors, or aesthetically powerful images, in order to awaken in other people the faculty of intuition which, even if dormant, is a part of the universally human endowment.¹⁰⁸

BRING BACK THE LEFT HEMISPHERE: THEOLOGY

Once we have acknowledged the limitation of language we are able, paradoxically, to bring back that most language-dependent, articulate and clear-thinking of our capacities, the left hemisphere. And we need to do so, even if only to confirm its limitations. That is to say, if we are to try to think and speak at all systematically about what a religious disposition may have had disclosed to it – if we are, to take a most basic example, to grasp at an *intellectual* level the primacy of metaphor and myth in understanding – we need the clarity, the ordering, the trying-to-make-sense-of-things that are the left hemisphere's forte. Within religion the left hemisphere helps us supplement ritual with theology. But the left hemisphere must remain the servant: what it 'serves up' must maintain respect for the provisionality, the ultimately incomprehensible mysteriousness of what the right hemisphere has had disclosed to it. Bringing back the left hemisphere here conforms to what I have consistently argued is the optimal mode of human understanding – reliance solely neither on the left hemisphere nor on the right, but rather on a process in which all that is to be known must initially 'presence' to the right hemisphere (we have no other access); then be transferred to the left hemisphere so as to gain expression through representation; and that re-presentation returned to the right hemisphere where it is either recognised for its consonance with the initial presencing and subsumed into a new *Gestalt*, or rejected. It is no different with the presencing of the divine. It's just that it is going to be more difficult, not least because it will once again present us with paradox.

As always we need the hemispheres to co-operate in fulfilling their proper roles. A religion inevitably formalises its philosophy and its ethical teaching, whether or not that is in the spirit of those whose teaching forms its foundation. For this there needs to be an optimal balance between autonomy and community, as in any healthy social group. Metaphysical speculation demands the bringing to bear of reason in the abstract, which is largely a left hemisphere specialisation: such a process does, however, need to know its limitations. The development of a moral code, based on a body of propositional knowledge, the establishment of a body of conventionally approved texts, the elaboration of celebratory rites and customs, require a

balance of hemispheric specialisations, but are clearly to a considerable extent left hemisphere-dependent. The same applies to the propagation of good works through institutions of different kinds involved in government, in education and in the care of the sick. All of this requires not just inspiration, imagination and vitality, but formal procedures providing cohesion and permanence; and this in turn relies to a large extent on a proper interhemispheric balance.

In the rabbinic tradition, two kinds of teaching are distinguished, one literal and legalistic, the other metaphorical and imaginative. These are referred to as *halakhah* and *aggadah*, respectively. According to the Midrash, a body of early rabbinic commentary on scripture, when God promised his people corn and wine, the corn was *halakhah*, the wine *aggadah*.

Abraham Heschel has this to say of these concepts, in a passage I quote at length, because the correspondences with the phenomenology of the two hemispheres, as described in this book, are so many and so striking:

Halakhah represents the strength to shape one's life according to a fixed pattern; it is a form-giving force. *Aggadah* is the expression of man's ceaseless striving that often defies all limitations. *Halakhah* is the rationalisation and schematisation of living; it defines, specifies, sets measure and limit, placing life into an exact system. *Aggadah* deals with man's ineffable relations to God, to other men, and to the world. *Halakhah* deals with details, with each commandment separately; *aggadah* with the whole of life, with the totality of religious life. *Halakhah* deals with the law; *aggadah* with the meaning of the law. *Halakhah* deals with subjects that can be expressed literally; *aggadah* introduces us to a realm that lies beyond the range of expression. *Halakhah* teaches us how to perform common acts; *aggadah* tells us how to participate in the eternal drama. *Halakhah* gives us knowledge; *aggadah* gives us aspiration. *Halakhah* gives us the norms for action; *aggadah*, the vision of the ends of living. *Halakhah* prescribes, *aggadah* suggests; *halakhah* decrees, *aggadah* inspires; *halakhah* is definite; *aggadah* is allusive ...

Halakhah, by necessity, treats with the laws in the abstract, regardless of the totality of the person. It is *aggadah* that keeps on

reminding that the purpose of performance is to transform the performer, that the purpose of observance is to train us in achieving spiritual ends ...

Halakhah thinks in the category of quantity; *aggadah* is the category of quality. *Aggadah* maintains that he who saves one human life is as if he had saved all mankind. In the eyes of him whose first category is the category of quantity, one man is less than two men, but in the eyes of God one life is worth as much as all of life. *Halakhah* speaks of the estimable and measurable dimensions of our deeds, informing us how much we must perform in order to fulfil our duty, about the size, capacity, or content of the doer and the deed. *Aggadah* deals with the immeasurable, inward aspect of living, telling us how we must think and feel; how rather than how much we must do to fulfil our duty; the manner, not only the content, is important.

And Heschel draws interesting conclusions. They are both necessary, he emphasises: ‘*Halakhah* without *aggadah* is dead, *aggadah* without *halakhah* is wild ... There is no *halakhah* without *aggadah*, and no *aggadah* without *halakhah* ... Our task is to learn how to maintain a harmony between the demands of *halakhah* and the spirit of *aggadah*.’ Nonetheless, not only is one greater than the other, but, as with the Master and his emissary, the one that should be subservient has come to dominate:

To reduce Judaism to law, to *halakhah*, is to dim its light, to pervert its essence and to kill its spirit. We have a legacy of *aggadah* together with a system of *halakhah*, and although, because of a variety of reasons, that legacy was frequently overlooked and *aggadah* became subservient to *halakhah*, *halakhah* is ultimately dependent upon *aggadah*. *Halakhah*, the rationalisation of living, is not only forced to employ elements that are themselves unreasoned, its ultimate authority depends upon *aggadah* ... ¹⁰⁹

With varying degrees of success a healthy balance is maintained between these hemispheric forces, provided, as Heschel says, *halakhah* (the viewpoint of the left hemisphere) plays a supporting, not the lead, role. In

this it is no different from the rest of life. That is how we come to have functioning religious traditions.

A THEOLOGICAL SPECULATION: PANENTHEISM

Niels Bohr thought that simple truths were consistent, but deep truths paradoxical in nature: and he greeted the emergence of a paradox with the words ‘now we have some hope of making progress.’¹¹⁰ I have explored the paradox of the One and the Many in Chapter 21. It is central to an understanding of the divine, because the divine is widely held in many cultures to be transcendent (beyond the world) and undivided, yet at the same time immanent (in the world) and present in all things. As Lord Krishna says to Arjuna of the wise man: ‘When he sees me in all and he sees all in me, then I never leave him and he never leaves me’: those ‘with spiritual vision ... worship me as One and as Many, because they see that all is in me.’¹¹¹

As always we need to resist choosing one truth only and ignoring the other; rather, we must see how the greater truth may hold both together.

I referred to the image of Indra’s net in which each point of connexion is linked to every other one and indeed reflects the whole net in itself. This web could be thought of as encompassing all things in the cosmos. So is this complex, creative, interconnectedness itself what we mean by God? That would certainly be one version of pantheism, the belief that all things are God, and God is all things. This, however, would be a God that was wholly immanent, as though the world could speak of nothing beyond itself. To me, that is a lack almost as unsatisfactory in its own way as its opposite pole, deism, whereby God is wholly transcendent – ‘a transcendent engineer on sabbatical leave’, as such a God has been described;¹¹² remote and unknowable, like the God envisaged by James Joyce’s Stephen Dedalus, ‘invisible, refined out of existence, indifferent, paring his fingernails’.¹¹³

Relationship seems to me the central element that is lost when things collapse into either pole in this way. Let’s go back to Wordsworth. The passage I quoted earlier seems to me the expression in poetry of panentheism, a belief that all things are *in* God, and God *in* all things:

... A motion and a spirit, that impels
All thinking things, all objects of all thought,

And rolls through all things.

And Wordsworth continues:

Therefore am I still
A lover of the meadows and the woods
And mountains; and of all that we behold
From this green earth ...

For me, this answers, better than pantheism, to my sense of there being something flowing, life-giving, creative, responsive, awe-inspiring and sacred *in* ‘all that we behold *from* this green earth’ – note, not just ‘*on* this green earth’ – but which can never be reduced to what can be seen or fully known; something that both inspires from within the world (is immanent) and embraces it from without (is transcendent); that takes into itself and owns what is good, together with what we are minded to oppose or reject as evil, without thereby becoming equated with such good or evil, even in part; something indeed having no parts; and being both *immediately* knowable and completely unknowable at the same time – as if ‘hiding in plain sight’. Moreover, engaging us by love: ‘therefore am I still a lover...’ Of course language breaks down here: so either you will find this absurd, or its meaning so transparent that it hardly needs saying at all.

Keith Ward, a formerly atheist analytic philosopher who, following a religious experience, became a theologian and went on to become Regius Professor of Theology at Oxford, points out that the belief that ‘God is certainly greater than but *includes* the universe’, is not just his own view, but one ‘very widely held amongst Christian theologians now’, as well as being an ancient Hindu belief.¹¹⁴ This of course does not make it true, but it does indicate that a similar intuition can be found in widely diverse traditions. It also resonates with a beautiful and (formerly) well-known phrase from the New Testament: ‘in him we live, and move, and have our being’.¹¹⁵

Panentheism is a theological category, a re-presentation by the left hemisphere of something intuited by the right. And although professional theologians might shudder at the idea, an intuitive form of panentheism is animism. As Tim Ingold points out, animism is not, as anthropologists used

to suppose, a belief system (such as is panentheism): that would be to impose our left hemisphere mentality on it. It is not, he says, 'a way of believing about the world but ... a condition of being in it'. As he puts it,

people do not universally discriminate between the categories of living and non-living things. This is because for many people, life is not an attribute of things at all. That is to say, it does not emanate from a world that already exists, populated by objects-as-such, but is rather immanent in the very process of that world's continual generation or coming-into-being.

The significance of this is that in almost all of Southeast Asia, China, Tibet, Japan, the Pacific Islands, Central and South America, Africa, and the circumpolar North – indeed in almost all parts of the world apart from Western Europe, the Middle East, and non-native North America – animism is the normal way to see the world. Animism, according to Ingold,

could be described as a condition of being alive to the world, characterised by a heightened sensitivity and responsiveness, in perception and action, to an environment that is always in flux, never the same from one moment to the next. Animacy, then, is not a property of persons imaginatively projected onto the things with which they perceive themselves to be surrounded. Rather ... it is the dynamic, transformative potential of the entire field of relations within which beings of all kinds, more or less person-like or thing-like, continually and reciprocally bring one another into existence. The animacy of the lifeworld, in short, is not the result of an infusion of spirit into substance, or of agency into materiality, but is rather *ontologically prior to their differentiation*.¹¹⁶

This way of being in the world seems to me so much more sophisticated than the way we normally carry on our lives in the West nowadays that it is no surprise that most Westerners can't begin to understand it. And what they fail to understand, they are, with the left hemisphere's characteristic arrogance, inclined to treat dismissively – as something 'primitive' or 'childish', to be 'outgrown'. It has nothing to do with propositional beliefs,

but is a matter of direct perception: animists see a world full of spirits not because they are trying to *explain* it, and come up with theories, which science will later ‘correct’; but because they perceive immediately that the natural world is not separate from them and is charged with holiness – not something, then, that as it were happened to fall across their path,¹¹⁷ as if it were a puzzle to be fretted over and *solved*, but full of individual living entities that are experienced directly as part of the same living whole as ourselves; individuals, like us, within a differentiated, but never wholly divided, unity.¹¹⁸

Panentheism sees everything as sacred, not just for our *use*. As John Muir put it:

No dogma taught by the present civilization seems to form so insuperable an obstacle in the way of a right understanding of the relations which culture sustains to wildness as that which regards the world as made especially for the uses of man. Every animal, plant, and crystal controverts it in the plainest terms. Yet it is taught from century to century as something ever new and precious, and in the resulting darkness the enormous conceit is allowed to go unchallenged.¹¹⁹

The Greeks, the Inuit, the Penan, the Chinese, the Indians, the intellectuals of the Western Middle Ages and of the Renaissance, the Australian Aboriginals, the Romantics, the Navajo, the Romans, the Blackfoot and the modern Japanese – and countless others – all thought, or think, that there is something speaking to us in nature. If we alone suddenly can’t hear it, in the West in the twenty-first century, how do we know it’s we who are right?

PROCESSES AND EVENTS

I have referred to Goethe's insight into the distinction between the two kinds of reason, *Verstand* (LH) and *Vernunft* (RH), before: '*Vernunft* is concerned with what *is becoming*, *Verstand* with what *has already become* ... The former rejoices in whatever evolves; the latter wants to hold everything still, so that it can utilise it.' In one of his conversations with Eckermann, he commented on the relation between these two faculties and our capacity to understand Nature, or the God of Nature:

Mere rationality (*Verstand*) cannot reach as far as Nature; man must be capable of raising himself up to the heights of intuitive reason (*Vernunft*), to touch the Godhead which expresses itself in the fundamental phenomena, physical as well as moral, and which lies behind them and from which they proceed. But the Godhead works in the living, not in the dead; it is in the becoming and the changing, not in what has become and is fixed. So it is that intuitive reason, in her inclination towards the Divine, has to do only with what is living and becoming, rationality with the already fixed and become, so that it may make use of it. ¹²⁰

I mentioned Jean Gebser's idea – already there in ancient Zen writings – that the divine is the deepest of springs, yet also that which continually springs forth from it; God, then, as an eternal process. Process theology is, put very simply, the belief that the divine is misconceived as purely a static entity outside time (though that is an accepted aspect of divinity), and is, at least in some important aspects, better seen as a process within time, an eternal Becoming rather than merely an eternal Being – though it is that, too. We need Heraclitus' insight that 'by changing, it stays the same'. In the Introduction, I mentioned that flow continually creates newness, while remaining itself stable: changing and yet not changing.

Process theology is a natural counterpart or companion to panentheism, since it, too, implies that God is in everything without being reducible to the sum of everything: the spring and that which comes forth from the spring.

There is a common prejudice that process theology is a modern invention: perhaps it is in its current forms (there are many). But it has resonances with a host of traditions including pre-Socratic philosophy, Taoism, Buddhism (including Zen), Judaism, mediaeval Christian mysticism, the philosophies of Hegel and Schelling, the writings of Wordsworth and Coleridge, and the philosophies of James, Bergson and Whitehead, among others – indeed Whitehead is the figure generally credited with originating process theology as such.

It is also suggested by the hemisphere hypothesis. For what the left hemisphere knows is secondary to whatever the right hemisphere knows. What the left hemisphere sees as finished, perfect, single, abstract, detached, motionless, beyond space and time, is virtual only; a reduced representation at an instant outside time of what according to the right hemisphere is always evolving, ever both self-differentiating and self-unifying, and involved with the process of creation and what it creates.

Throughout Part III, I have emphasised a number of positions that are not the norm in our culture (though they are, I believe, accepted by many contemporary physicists); the primacy of motion over stasis, and the importance, in particular, of flow; the reality of time as an expression of that extended flow, not a series of linear moments; consciousness and matter as not simply irreconcilable, leaving us with the problem of how to get consciousness out of matter, but in reality aspects of one another, in which consciousness is nonetheless primary; and the world having purposiveness without reductive, preordained purposes. As the reader will have observed, all of these themes are consistent with what I have to say in this chapter.

Similarly the idea that relationships and processes are more fundamental than things and ‘states’ has been a main theme of this book, so I will deal with this only briefly here, emphasising, though, for the first time how it is expressed within the world’s great religious traditions, and in spiritual thinking to the present day.

Where, then, do I see it?

In the Biblical story of Moses and the burning bush, God is said to have declared, in most English translations, ‘I am that I am’. Apparently the simplest and most direct translation of the Hebrew words, *ehyeh asher ehyeh*, is ‘I will be who (or, that which) I will be’. In the *Zohar*, a body of kabbalistic texts, the appellation ‘I will be’ (*ehyeh*) is applied to the highest of the emanations of the infinite by which the cosmos is constantly

sustained and created, known as *Keter*. This indicates, according to Sanford Drob, ‘*Keter*’s limitless potential, and its wilful movement toward a future.’¹²¹ Here I find a close parallel to the view of a God and cosmos that are purposeful, yet undetermined, and *each* in the process of becoming what they are. (If God is in the cosmos and the cosmos in God, as in panentheism, in such a way that they cannot be wholly separated – though never merely equated – this would naturally follow.)

In the account of the creation contained in the opening of the Book of Genesis, after each act of creation, it records that God looked and ‘saw that it was good’.¹²² To me this speaks of an encounter with something new, of something free and hitherto undetermined – of veritable creation; not just, as Bergson put it, the unfolding of a fan. What it suggests is that God did not know already that it was good (the Hebrew word can also be translated ‘beautiful’) without having to see it. It speaks of something free, and *Other*. (The realm of the right hemisphere is relatively speaking, that of the uncertain and undetermined, the left that of the certain and determined; moreover the right hemisphere is the one that preferentially relates to what is *Other*, the left hemisphere to what is already known and has been internalised. And, in Chapter 8, I related the evidence that, unsurprisingly therefore, *creativity* involves principally the right hemisphere.)

Turning to the tradition of Christianity, philosopher John Lucas points out, in a fascinating paper entitled ‘Begotten not made’, that the phrase used in St John’s Gospel to express the incarnation, the word ‘was made’ flesh, departs from the sense of the original Greek ἐγένετο, which is much better translated as ‘became’.¹²³ ‘The word was made flesh’ suggests a single, discrete, wilful, act of ‘being done to’; by contrast, ὁ λόγος σὰρξ ἐγένετο (*ho logos sarx egeneto*) suggests ‘a natural inherent process’ of becoming. The intended meaning is that the *logos*, the universal origin, ground or reason, *became embodied*.

‘The distinction between *becoming* and *being made*’, Lucas reflects,

continues through the Middle Ages down to the present day. Duns Scotus was a ‘becoming’ thinker. He sought explanations, arguing for the existence of God as the ultimate explanation, with the universe evolving in an intelligible way ... William of Ockham, by contrast, was a ‘maker’. He emphasised the importance of the will, and the power of an omnipotent God to do whatever he liked. We

can see him as the spiritual progenitor of the Atomists' point-particles placed in a uniform and featureless space wherever God wanted them to be according to the inscrutable counsels of omnipotence.

Here Lucas contrasts, in the works of two loosely contemporary mediaeval philosophers, an evolutionary flow, on the one hand, a process of Becoming, in which all comes to be individuated (Duns Scotus was also the originator of the term *hæcceitas* to express the importance of the unique individual element), though remaining part of one whole; and an account, on the other hand, of the wilful exercise of omnipotence, arbitrarily disposing things as 'point-particles ... in uniform and featureless space'. It is impossible not to recognise a right hemisphere-congruent way of conceiving reality – 'becoming', a process – contrasted with a left hemisphere-congruent way – 'was made', literally (*factum*), a deed or fact.

The greatest of the mediaeval mystics, Meister Eckhart, is associated with what has been called a 'metaphysics of flow'.¹²⁴ For him Being, which emanates from the loving God, must flow, because, like love, it constitutes a continual movement toward the Other. Moreover, it is a Becoming: according to Eckhart, God (in his incarnate form as Christ) streams forth from the Father's heart endlessly into the God-loving soul: 'he is being born anew unceasingly ... And this same birth today in the God-loving soul delights God more than his creation of the heavens and earth.'¹²⁵ Eckhart is said to have said: 'We are all meant to be mothers of God, for God is always needing to be born'.¹²⁶ According to him, then, God also depends on us for his Becoming.

The idea that God is love, or even the 'word' (*logos*), suggests that ultimately what is primary is relationship: a word exists only in the betweenness of utterance and audition, which has the same structure as love. Love is an experience always in process, never a thing or anything like a thing. The mediaeval mystic Mechthild of Magdeburg spoke about the 'flowing light', the 'flowing fire' of God's love, which 'never stands still and always flows effortlessly and without ceasing in so sweet a flood'.¹²⁷

All of this is more consonant with the right hemisphere's take on the world than that of the left: it depends on process not stasis; it places the emphasis on relationship not on entities that must be related *post factum*; it

embraces, rather than flees from, paradox. If God is Becoming, at least as known from within creation – which is all we can know – this has important consequences. Oddly (since it might seem to do the opposite) it has the effect of removing God from time (in the sense of *temps*, though not of *durée*: see Chapter 22). For if God were to be the first cause, in some sequential sense of that word ‘first’, or a creator God that ‘started things off’, God would be inevitably situated as performing a function in time (if not, God could not act as the temporal first cause). Instead, a God that is endlessly Becoming is already situated in an eternal Now; and we are back to the true meaning of the first cause – not a cause on a timeline, but an ongoing ground of Being. So Meister Eckhart says: ‘God is in all things ... God is creating the whole world now, this instant ... Where time has never entered and no form was ever seen, at the centre, the summit, of the soul, there God is creating the whole world.’¹²⁸

In a not dissimilar vein the early seventeenth-century philosopher and mystic Jakob Boehme says: ‘It is an everlasting beginning. It begins itself perpetually and from eternity to eternity, where there is no number; for it is the Unground.’ According to Boehme, what he calls the Unground is an eternal Nothing, which yearned for Something: out of which there arose *Becoming*. Longing, the right hemisphere’s awareness of God,¹²⁹ was (according to Boehme) the Unground’s drive to create. This Becoming is a constant longing *and* its fulfilment in a something that is evermore coming into Being.¹³⁰ This idea shares resonances with Buddhism; and with the Wordsworthian idea of Nature, both as she is in herself and in our understanding and response to her, as, in a wonderful phrase, ‘something evermore about to Be’.

And Nature, and the one unifying spirit that Wordsworth believed we encounter in Nature, *flows*. He felt himself swept up in a flow of vital energy when in moments of sublimity ‘my blood appeared to *flow* / With its own pleasure, and I breathed with joy’. So Emerson wrote that ‘in the presence of nature, a wild delight *runs* through the man, in spite of real sorrows’. Wordsworth’s sense of a spirit that impels, and ‘*rolls* through all things’ is close to Emerson’s description of rapture occasioned by Nature, when ‘I am nothing; I see all; the currents of the Universal Being *circulate* through me; I am part or particle of God.’¹³¹

What Wordsworth expressed more poetically, his friend and literary companion Coleridge expressed more philosophically. The best of

Coleridge's thinking, in my view, lies not in his more abstract, Schellingian disquisitions, but in the many astute observations he made throughout his life on Shakespeare, whose works were for him like the productions of Nature herself. (Kant, in whose work Coleridge was immersed, thought that only artists could attain to genius, since they participated intuitively in the very creativity of organic Nature: they brought new forms into being in their wholeness, not simply putting them together from distinct parts.) In his reflections on Shakespeare, Coleridge crystallised some philosophical insights that we may recognise.

The first might be this. By contrasting the works of Shakespeare with those of his lesser contemporaries, Coleridge is able to illuminate the relationship between a true creator (in this case Shakespeare) and his creation. He does this through a contrast between the nature of the 'dead', static, finished, concatenated products of a controlling, ever obvious, will – the God of deism; and, on the other hand, the 'living' creations of an animating, in some sense hidden and unknowable spirit, which are themselves unknown ahead of time, and come seamlessly into being, as if generating themselves within the flow – God as the *tao*. This is the mediaeval philosophical distinction, later taken up by Spinoza, between, respectively, *natura naturata* and *natura naturans*. In the works of Beaumont and Fletcher (Shakespeare's more workaday contemporaries), says Coleridge, 'you will find a well arranged bed of flowers, each having its separate root, and its position determined beforehand by the *will* of the gardener'. In Shakespeare, by contrast, 'all is growth, evolution, γένεσις [genesis] – each line, each word almost, begets the following – and the will of the writer is an interfusion, a continuous agency, no series of separate acts.'¹³²

In one of his lectures, Coleridge says:

The form is mechanic when on any given material we impress a pre-determined form, not necessarily arising out of the properties of the material – as when to a mass of wet clay we give whatever shape we wish it to retain when hardened – The organic form on the other hand is innate, it shapes, as it develops itself from within, and the fullness of its development is one & the same with the perfection of its outward Form. Such is the Life, such is the form. Nature, the

prime genial artist, inexhaustible in diverse powers, is equally inexhaustible in forms.¹³³

Earlier I remarked on the generous profligacy of Nature, and its inversion of the *lex parsimoniæ*. The literary scholar AD Nuttall observed of Shakespeare that his works may be ‘likened to Ockham’s beard, golden, luxuriant, not yet subdued (happily) by the famous razor.’¹³⁴

Then, second: we have seen that, in *living* systems, it is by changing that things remain the same – permanence and impermanence, durance and process, are aspects of one and the same phenomenon. So Coleridge remarks that what Shakespeare gives us is a union of ‘the liveliest image of succession with the feeling of simultaneousness’.¹³⁵ ‘In Shakespeare’, he writes elsewhere, ‘there is neither past nor future, but all is permanent in the very energy of nature.’¹³⁶ Process and durance together.

Thirdly, he sees that this process involves the all-important union of division with union; maximal individuation, that does not disrupt, but rather enriches, the whole. So, in Shakespeare, ‘the play is a *syngenesia*’, he writes, invoking an image from botany suggestive of individuation within a unified whole.¹³⁷ Of Shakespeare’s characters he writes, ‘each has indeed a life of its own and is an *individuum* of itself, but yet an organ to the whole.’¹³⁸ The creative force is still entirely itself, even when it is expressed in the most *individuated* form: thus, ‘Shakespeare becomes all things, yet forever remaining himself;’¹³⁹ he is enabled ‘to become by power of Imagination another Thing – Proteus, the river, a lion, yet still the God felt to be there’.¹⁴⁰ In this last phrase, the analogy between the very greatest of human creations and the divine creation of the cosmos is made explicit in Coleridge’s language. These expressions, if applied to the relation of God to his creation, rather than Shakespeare to his, are pure panentheism.

And finally, in an analogy with the hiddenness of God, who is both wholly revealed and wholly concealed in his Creation, Coleridge writes of Shakespeare’s work that it is ‘all Shakespere, & nothing Shakespere’.¹⁴¹ These thoughts were later to be echoed by T.S. Eliot: ‘The world of a great poetic dramatist is a world in which the creator is everywhere present, and everywhere hidden.’¹⁴² He was, of course, thinking of Shakespeare.

Ultimately we have to reconcile the tendency to flux with a tendency to stasis, change with (some degree of) permanence. The worlds of the right hemisphere and the left have to be brought into fruitful conjunction. Here too Coleridge saw what was needed:

To *reconcile* therefore is truly the work of the Inspired! This is the true *Atonement*—/ i.e. to reconcile the struggles of the infinitely various Finite with the *Permanent*.¹⁴³

Atonement is literally ‘at-one-ment’: reconciliation of apparent incompatibles.

These philosophical positions would have been familiar to Schelling, from whom Coleridge learnt much. I have discussed Schelling’s philosophy, as it relates to the creative process in Nature, in a previous chapter. Matthew Segall notes that ‘Nature was no mere appearance for Schelling, but rather the living ground and visible body of an *eternally incarnating* divinity.’¹⁴⁴ Not a divinity that had incarnated once, note, but one that is always incarnating itself in the evolving cosmos. For Schelling, and it is a position to which I subscribe, the imagination is not, as for Kant, a faculty that creates merely the best we can manage as a *re-presentation* of the world; nor is it making the world up from scratch. It is collaboratively allowing the world to *presence*, bringing the world into existence; and if it is the case that the soul is not separable from the God that is the ground of all that is, this is entirely in keeping with the imagination helping to constitute the world as it really is. This is remarkably similar to Eckhart’s deep insight that ‘the nature of God ... is to give birth,’ and that the birth happens in the soul of each one of us.¹⁴⁵

Whitehead wrote that ‘the elucidation of meaning involved in the phrase “all things flow” is one chief task of metaphysics’.¹⁴⁶ I follow him in seeing processes and relationships, not things themselves, as the fundamental realities.

Does this tell us something about the nature of God? Whitehead thought so. Moreover he saw God as the principle that made possible, and was expressed in, the newness of creation, the presence of order in complexity, and of purpose, within the cosmos. His view of God’s interaction with the cosmos is dialectical, in that God and the world fulfil each other and bring

each other into being. The one and eternal becomes many and ceaselessly changing, just as the many and ceaselessly changing become one and eternal. In the words of Schelling once more: ‘Existence is the conjunction of a being as One, with itself as a Many.’ This is not, then, as Whitehead crucially recognised, two processes, but two *facets of a single process*:

It is as true to say that God creates the World, as that the World creates God ... Neither God, nor the World, reaches static completion. Both are in the grip of the ultimate metaphysical ground, the creative advance into novelty. Either of them, God and the World, is the instrument of novelty for the other.¹⁴⁷

God, truth, and infinity are all processes, not things; comings into being, not entities that are already fixed. All three seem to me, however, like rivers, to combine, stability with flux. ‘All things flow’; but ‘by changing, a thing remains the same’.¹⁴⁸ Ultimately Being and Becoming are aspects of the same thing.¹⁴⁹ It’s just that our culture emphasises Being to the exclusion of Becoming. However, as usual, there is an asymmetry: they are not equal. In the philosophy of Whitehead, the divine is Becoming, and Becoming is even more fundamental than Being. In keeping with this, Wolfgang Pauli described the quantum theory he helped to establish, not as a theory of being, but as ‘a theory of *becoming*’. He saw what he called the ‘interplay’ between possibility and actuality as ‘dialectical’.¹⁵⁰ And the theoretical physicist David Bohm said, even more clearly, that

in my scientific and philosophical work, my main concern has been with understanding the nature of reality in general and of consciousness in particular as a coherent whole, which is never static or complete but which is an *unending process of movement and unfoldment* ...¹⁵¹

What Bohm called the Implicate Order unfolds itself continually. But he also believed it was then re-enfolded.

Oddly enough, we find ourselves here close to the perceptions of a much earlier figure, one that we have repeatedly encountered in Part III, Nicholas of Cusa. He tried to explain his understanding of the relationship

between God and his creation through a metaphor of *unfolding* from inside outwards (*explicatio*, from Latin *ex-*, out), and *enfolding*, from outside inwards (*complicatio*, from Latin *com-*, with, + *plicare*, to fold).¹⁵² According to this formulation, while all beings are an ‘unfolding’ of God in time and space, they are at the same time ‘enfolded’ in the undifferentiated oneness of God, their divine source. In terms of the hemisphere hypothesis, we recognise the same process by which we come to understand anything whatsoever: what is at first *implicate* is taken up by the right hemisphere, then *explicated* by the left hemisphere, and then the products of that explication re-enfolded or reintegrated in its more *complicated* form by the right hemisphere’s vision of the whole once more. This is how the hemispheres, when they work well together, co-operate in giving us insights into the depths of reality.

POTENTIALITY AND ACTUALITY

According to Whitehead, the World converts potentiality into actuality; what the World makes actual, God takes back into a field of receptive potentiality, one so shaped as to draw what has been created onwards towards further fulfilment in actualisation. It is because of this reciprocal, yet opposite, motion, that God and the World ceaselessly bring something into being, the world drawing actuality out of possibility, and God responding to that actuality with further possibility.¹⁵³

This idea is already there in early Renaissance theology. In *On the Summit of Contemplation (De apice theoriæ)*, Cusanus calls God *posse ipse*, that is, Possibility Itself. But he also used the term *possest* for God. *Possest* is, as Bond puts it,

a play on words, a coincidence of *posse* ('can') and *est* ('is'), the Can, the Possibility that at the same time Is, the Can-Is, which only God can be.¹⁵⁴

This is another way of expressing a similar insight to Whitehead's, since what Whitehead calls God and World, Cusanus saw as different aspects of the divine (which is why it can be all three – *posse*, *est* and *possest* – at once). I do not believe that Whitehead would have dissented from this. He did not see God and World as wholly separate entities, but as two distinct aspects of a seamless process, the process of creation.¹⁵⁵

Such ideas as these are hardly peripheral or unorthodox in the history of Christianity. Thomas Aquinas thought of God as an infinite potential, attracting things to their fulfilment. Yet in doing so God is not seen as determining, engineering or controlling, though neither is God merely passive. From this perspective, God is seen as the ultimate good who attracts all things to their flourishing, the possibility that is most fulfilling for them, but does not *compel* them to take that path: they have the freedom to respond for better or for worse. This is like a lover, who by virtue of love draws whatever emerges in the loving relationship towards a greater fulfilment in love, but cannot in any way enforce such an outcome.

In the last hundred years such ideas have taken various forms that reflect the same basic structure. Jung's idea of the collective unconscious, while certainly not equivalent to the concept of *posse ipse*, is nonetheless an attempt to articulate a sense of an absolute origin that also guides the individual life: we arise from its common and timeless field, yet are independent of it, while being nonetheless in constant relation to it, drawn towards it and influenced by it, as if by a gravitational field. We are free to heed or not to heed (and at present, we seem to be heeding very little). The form or field of potential – God, *Ein-sof* in the Kabbalah, the collective unconscious to Jung – draws something out of the world to meet itself.¹⁵⁶ This is Whitehead's constant creative advance into the newness of being: Becoming.

This relationship is put at its most dramatic by Meister Eckhart who says that God depends on the human soul as much as the human soul depends on God. Equally in the Kabbalah, according to Drob,

just as humanity is dependent for its existence upon *Ein-sof*, *Ein-sof* is dependent for its actual being upon humanity. The symbols of *Ein-sof*, *Shevirah* (rupture) and *Tikkun* (repair) thus express a coincidence of opposites between the presumably opposing views that God is the creator and foundation of humanity and humanity is the creator and foundation of God.¹⁵⁷

Returning once more to Whitehead, he did not see the process as something remote, abstract and mathematical – as though the world and God had no part in the values that are embedded and embodied in the process – but one characterised by compassion (literally, 'suffering with'): 'What is done in the world is transformed into a reality in heaven, and the reality in heaven passes back into the world ... In this sense, God is the great companion – the fellow-sufferer who understands.'¹⁵⁸ Christianity is, above all, the religion that speaks of vulnerability and love, in the image of a God that cared for creation in such a way as to be unable not to suffer in and alongside it. Whitehead nonetheless thought Christianity had erred by presenting God as a divine ruler, whose outstanding characteristic is power: he preferred what he called 'the brief Galilean vision of humility',

characterised by love.¹⁵⁹ There are hemispheric implications here, too, that are too obvious to need pointing out.

HOLARCHIES

I quoted physicist David Mermin's saying that 'correlations have physical reality; that which they correlate does not'. In explaining this he writes:

The physical reality of a system is *entirely contained* in (a) the correlations among its subsystems and (b) its correlations with other systems, viewed together with itself as subsystems of a larger system.^{[160](#)}

All of reality is a network in which our attention artificially isolates different, but cognate, sets of immediate relations at each level with which it interacts. This, in turn, is not unlike Koestler's idea of what he called a holarchy. Theise and Kafatos, writing of the phenomenon in biology, say:

in fact, the whole exists not at any single level of scale, nor in a hierarchy of systems, but, to use Koestler's term, as a holarchy, a holistic (quantum-like) superposition of all levels of scale, [as imaged in] our bodies which are comprised of human and non-human cells. At the nanoscopic scale, cells themselves disappear from view to reveal atoms and molecules self-organizing in aqueous suspension. No single scale of observation can reveal the whole; at the moment selection is made of a scale of observation, the features of other levels of scale are hidden from view.^{[161](#)}

Cusanus was fond of the saying *quodlibet in quolibet*: 'each thing is in every thing'. According to Cusanus scholar CL Miller,

just as God is present to each creature that stands as a contracted image of the divine, so the universe as a macrocosm is present to each creature or constitutive part as microcosm. In that way, each natural thing is an image of the collective whole. But since this collectivity is made up of interrelated parts, each thing is also the totality of its connections with everything else. 'Each thing is in

each thing' because each is an image reflecting the oneness of the whole and thus of all other individuals that are the interrelated parts of that whole.¹⁶²

This gives reality an essentially nested structure, in which what looks like a part at one level, is a whole at another. Thus the subatomic particle is to the atom, as the atom to the molecule, as the molecule to the compound – to the organelle, to the cell, to the tissue, to the organ, to the body, to the family, to the community – and so on up to the whole earth, and the cosmos beyond. As one moves the plane of focus, one *Gestalt* comes into being and another is relinquished. This ex-plicates (and com-plicates, in Cusanus's sense) an insight that is part of the perennial philosophy, and is encapsulated in the Vedic saying: 'as is the individual, so is the universe; as is the universe, so is the individual'.¹⁶³ It also recalls the image of Indra's net, since in each jewel all the others are reflected, something akin to a hologram. And according to the kabbalists, since the microcosm perfectly mirrors the macrocosm, the *Sefirot* are 'not only the dimensions of the universe, but also the constituent elements of the *human mind*.'¹⁶⁴

This draws attention to the fact that the universe is one whole and yet is seen in every part: if one looks deeply into the particular, one sees the universal, one of Goethe's most important insights. Or as Whitehead put it: 'you cannot abstract the universe from any entity ... so as to consider that entity in complete isolation ... In a sense, every entity pervades the whole world.'¹⁶⁵

Referring to the way in which, until the last couple of centuries, we used to understand everything in the cosmos by analogy, Bohm commented: 'The human being was a microcosm of the cosmos, so that he had implicitly in him the possibility of understanding it. The general view before our modern times was more favourable to wholeness – in Europe as well as in the East.'¹⁶⁶ The mediaeval idea that we are microcosms, that we reflect the universe, is curiously close to the idea of fractality, or the hologram – we are images of the very forms and processes of the universe. That the cosmos is fractal or holographic is indeed not an idea alien to modern physics.¹⁶⁷ It is also a striking feature of the philosophy of the three thinkers in German intellectual history who were most myriad-minded in their interests and

abilities, in their ‘universal genius’: Nicholas of Cusa, Leibniz and Goethe.^{[168](#)}

THE HIDDEN AND THE MANIFEST

In some places, Cusanus images God's relation to the world by using the metaphor of light. We cannot see light if there is nothing to reflect it (space looks dark, even though light constantly passes through it). When there is a reflection, we see not light, but the object that reflects it. Light itself we cannot see: yet in its absence we can see nothing.¹⁶⁹ The created world is a direct reflection of God in creation: we do not 'see' God, but without God we would 'see' nothing. If we take this metaphor from the realm of the senses to that of the intellect and the soul, we are made to understand that there is no being without Being, yet we do not perceive Being itself: rather we perceive its reflection in the world, and everything we do perceive is perceived only because of that reflection. The light is in itself invisible, a darkness to our intellect. This may be, I suggest, part of what mystics mean when they say that God is everywhere visible and nowhere visible, and what Goethe meant by saying that nature is a 'holy open secret' (*heilig öffentlich Geheimnis*).¹⁷⁰ The idea that the hidden and the manifest are dipolar characteristics of one reality is well expressed in the *Tao Te Ching*:

Ever desireless, one can see the mystery.
Ever desiring, one sees the manifestations.
These two spring from the same source but differ in name;
this appears as darkness.
Darkness within darkness.
The gate to all mystery.¹⁷¹

I mentioned in Chapter 20 that the phrase *coincidentia oppositorum* comes from Cusanus. Though generally cited as found in his treatise *On Learned Ignorance* (*De docta ignorantia*), this would appear not to be correct. It occurs several times, however, in *The Vision of God* (*De visione Dei*): for example, Nicholas writes

Hence I observe how needful it is for me to enter into the darkness,
and to admit the coincidence of opposites, beyond all the grasp of

reason, and there to seek the truth where impossibility meeteth me
...

And, particularly movingly, to my way of thinking,

I begin, Lord, to behold Thee in the door of the coincidence of opposites, which the angel guardeth that is set over the entrance into Paradise.¹⁷²

In these passages Cusanus suggests the need to enter into a darkness of unknowing which is also the door to Paradise – itself a coincidence of opposites – accessible only to whomever is able to abjure *finally* the attempt to apprehend God through reason (at least in as much as that is of the kind that precludes the possibility of ‘opposites’ being true). God is beyond the familiar domain where opposites hold sway: in God they are reconciled. Thus it is that the darkness is in reality a form of extreme brightness. In the mystical literature, God is often described in these terms. Dionysius the Areopagite, in his *Mystica theologia*, wrote of ‘the superessential Radiance of the Divine Darkness ... the superessential Darkness which is hidden by all the light that is in existing things’.¹⁷³ Much later, in the seventeenth century, the mystical poet Henry Vaughan, whose work is impregnated with imagery of light and dark (the title of his great collection of poems *Silex Scintillans* means ‘the flint that yields a spark’) wrote: ‘There is in God (some say) / A deep, but dazzling darkness...’.¹⁷⁴

GOD AS *COINCIDENTIA OPPOSITORUM*

In his *The Hunting of Wisdom (De venatione sapientiæ)* Cusanus alludes to Dionysius and endorses his view that ‘opposites are to be affirmed and denied of God at the same time’.¹⁷⁵ And in *The Vision* he notes that we affirm of the incarnate God ‘most true contradictories. For you are creator and likewise creature, the attracting and likewise the attracted, the infinite and likewise the finite.’¹⁷⁶ God is not simply oneness, according to Cusanus, but ‘oneness to which neither otherness nor plurality nor multiplicity is opposed’.¹⁷⁷ Unity and multiplicity are finally reconciled in God.

When one reaches the infinite, opposites coincide and the opposition is resolved (any ‘arc’ of an infinitely large circle would be a straight line: any straight line infinitely prolonged would become a circle). In Buddhism, one is constantly reminded that true fulfilment is emptiness. In the Kabbalah, *Keter*, the utmost crown of the *Sefirot*, represents emptiness in the infinite. ‘At infinity thoroughgoing coincidence occurs’, writes Bond referring to Cusanus. However:

The coincidence of opposites provides a method that resolves contradictions without violating the integrity of the contrary elements and without diminishing the reality or the force of their contradiction. It is not a question of seeing unity where there is no real contrariety, nor is it a question of forcing harmony by synthesizing resistant parties. Coincidence as a method issues from coincidence as a fact or condition of opposition that *is resolved in and by infinity*.¹⁷⁸

Neither opposite is excluded. Only their mutual exclusion is excluded.¹⁷⁹

The dipolar relationship between being and becoming in theory should – and it seems to me in practice does – apply to infinity. The mathematical physicist Edward Nelson distinguished potential and actual infinity. He described a feeling of ‘loathing’ and oppression when thinking about what he called ‘actual infinity’. Following Whitehead he called it ‘the antithesis

of life, of newness, of becoming – it is finished.’¹⁸⁰ ‘Perfect’ literally means completed – done with. The achieved infinite of the left hemisphere is unreal (can never be achieved) and is lifeless; the constantly becoming, processual, infinite of the right hemisphere is real and life-giving. Note that this is an *inversion* of what we normally hold, namely, that potential means unreal, and actual means real; something I touched on in Chapters 21 and 22.

It seems to me, that, as usual, when it comes to the nature of Being, or God, we are easily attracted to, and too readily comforted by, the idea of a fully achieved perfection, rather than one of open dialectical creativity, continually both expressive and receptive. When God is analogous with Nelson’s ‘actual’ infinity, he is re-presented – literally no longer present – and therefore, if one can put it that way, for the time being dead.

Another important figure in the rich literature of mediaeval mysticism is the fourteenth-century Flemish writer Jan van Ruysbroeck. ‘God in the depths of us’, he said, ‘receives God who comes to us: it is God contemplating God.’¹⁸¹ God comes to know himself in the Other: we come to know ourselves in God: the whole comes to know itself through the part, but the part comes to know itself through the whole. And he goes further: ‘We behold that which we are, and we are that which we behold; because our being, *without losing anything of its own personality*, is united within the Divine Truth.’¹⁸² We are fully ourselves, and our union with God does nothing to negate (rather fulfils) that reality; so that if, through the purity of soul of which Ruysbroeck is speaking, we are enabled to see God, we see the reality of the soul. This is remarkably similar to Schelling’s ‘What in us *knows*, is the same as what *is known*.’¹⁸³ For him, for James, for Bergson, for Whitehead, and for others, a conscious creative cosmos comes to know itself through its never-ending coming into being. And as I suggested in the first few pages of the Introduction to Part I, creativity is always also self-creation: discovery of the self as well as of the other.

That the Creation is fulfilled in the process of differentiation and yet wholly at one with the God of creation is implicit in pantheism: ‘the more we understand individual things, the more we understand God’, wrote Spinoza.¹⁸⁴ As Roger Scruton comments on Spinoza the pantheist: ‘the distinction between the creator and the created is not a distinction between two entities, but a distinction between two ways of conceiving a single reality’.¹⁸⁵ Panentheism, however, permits something further: the

possibility that God has a relationship not just with the divine self, but with something Other; and this, it seems to me, is the drive behind there being a creation at all. For me, this is further grounds for preferring panentheism to pantheism. We need immanence, yes, which pantheism offers; but we need the union of transcendence with immanence, which only some form of panentheism encompasses. Yet again, we need union, but we need that to be the *union of division with union*.

REPORTING BACK TO THE RIGHT HEMISPHERE

There was a lot of the left hemisphere's struggling with reality in the last few pages, and there's nothing wrong with that. But, as we have seen, the occupational hazard of the left hemisphere is to believe that its necessarily narrower re-presentations constitute the reality. The danger applies here too: we are tempted to treat panentheism as a left hemisphere intellectual representation, a source of argument, rather than something intuited by the right hemisphere as a source of wonder. We should resist the temptation to take it as gospel – which is why I talked about a 'speculative' theology of panentheism. There are no certainties here. In a well-known saying, attributed to Eugene Gendlin: 'We think more than we can say. We feel more than we can think. We live more than we can feel. And there is much else besides.' But the attempt to use language is not irrational: the struggle, as I say, is not wasted effort. It is merely not enough. ¹⁸⁶

It has been a consistent argument of this book that the left hemisphere is a fine servant but a disastrous master, and that its results need 'returning' to the right hemisphere for assessment of their validity, and reintegration into a now enriched vision of the world. It is their consistency with what the right hemisphere has intuited with greater richness, but less of an argumentative structure, that is required. The most we can hope for is some sense that an analytic theology might at least seem true to – faithful to – the intuited perceptions of the right hemisphere expressed, as they tend to be, in terms of metaphor and myth. How does panentheism fare?

One myth that seems to me strikingly consonant not only with panentheism but, even more extraordinarily, with the hemisphere hypothesis of this book is to be found in the Lurianic Kabbalah. (I should say that I was not brought up in the Jewish tradition and knew nothing whatever of the literature until the last few years: this makes the correspondences with the hemisphere hypothesis and the thesis of this book all the more striking to me.)

When the first Being, *Ein-Sof*, made the world, there were three phases. What was *Ein-Sof*'s first act? To stretch out a hand and make something happen? No – it was to *withdraw*. To make a place for something other than

Ein-Sof to be: an act of self-abnegation. This phase is known as *tzimtzum*, contraction.

In the space that results, there lie the *Sefirot*, emanations of *Ein-Sof*, vessels prepared to receive the divine light. Sparks of light from the divine Being land on the vessels made to receive them, but the vessels cannot contain them, and they shatter. This phase is known as *shevirat ha-kelim*, the shattering of the vessels.

The third phase is known as *tikkun*, repair, in which the sparks of light are gathered up again into the Godhead, and the fallen, shattered pieces, still retaining sparks of light, are rebuilt as stronger and more beautiful vessels.

It is important, incidentally, that humanity is called on to play a central role in *tikkun*. Thus again we are not just passive responders to a divine cosmos, but are part of bringing it about – or declining to bring it about – through our free will:

Shards from the shattered vessels attached themselves to sparks of divine light and were scattered throughout the cosmos. These kernels of entrapped divine energy are to be found everywhere, and especially within the human soul. According to Luria, each man and woman is enjoined to ‘complete creation’ by liberating and raising the sparks within his or her own soul and environment and reconstructing the sefirot in a new, more complete and stable form which reflects the image of both God and humanity.¹⁸⁷

Though not conventionally panentheistic, the panentheist character of this mythos, with its sense of God as both transcendent and immanent, hardly needs pointing out. In the Kabbalah, the idea of God being other than and yet one with his creation is made both more explicit and more particular. *Ein-Sof* in the kabbalistic literature is that aspect of God which is infinite. The sefirot are the emanations from that infinite *Ein-Sof* which sustain creation: the highest of these is *Keter*, which we have encountered, and the lowest is *Malchut*, or kingship. ‘If the goal of creation is the actualization of what exists only potentially within *Ein-Sof*’, writes Drob, ‘... then the sefirah *Malchut* is the very fulfilment of the divine plan.’ Thus ‘*Ein-sof* finally comes to know Himself in an “other”.’¹⁸⁸

This extraordinarily redolent *mythos* appears to intuit the way in which I believe everything comes into being – not just in the cosmos at large, but for us, phenomenologically, through the interaction of the hemispheres. The first ‘act’ is not the making of something happen, but the open receptive attentional field offered by the right hemisphere in which all new experience begins. It creates a space for something to be: *tzimtzum*. The attempt is then made to ‘pour’ whatever is received by the right hemisphere into the various categories, verbal or otherwise, that the left hemisphere brings to bear on it, but these prove inadequate to contain the meaning that was there in the first manifestation or ‘presencing’, and they break down. Analysis and language, in other words, reach their limits: *shevirat ha-kelim*. The meaning has to be returned to the right hemisphere to be ‘restored’ by understanding it as a whole again. This synthesis engenders a new, richer, wholeness: *tikkun*. I have compared this with the process whereby we learn a piece of music: initial receptivity; fragmentation and analysis in the pursuit of technical proficiency; followed by a new synthesis in which the previous phase is entirely banished from mind. Yet, crucially, no phase of the process is dispensable: every phase, including fragmentation and analysis at one stage, the shattering of the inadequate vessels, played its part. As in the kabbalistic *mythos*, the process is dialectical.

Of course there are any number of creation myths, many of them bearing little relationship to either panentheism or the hemisphere hypothesis. So to repeat what cannot be repeated too often: the fact that a panentheist theology finds resonance in a Lurianic creation myth does not make it ‘true’ in the sense that our left hemisphere has come to use the word. There can be no certain truth in speaking of the divine. But there is resonance, and the test is whether it answers to experience. It answers to mine.

There is, further, more than a little similarity here with Hegel’s view of how something becomes an object of thought, an idea. ‘The idea as a process runs through three stages in its development’, he says. ‘The first form of the idea is life: that is, the idea in the form of immediacy [RH]. The second form is that of mediation or differentiation; and this is the idea in the form of knowledge [LH].’ And finally, the result is ‘unity enriched by difference ... the third form of the idea, the absolute idea [RH synthesis]’, which Hegel says is ‘at the same time the true first’, having ‘a being due to itself alone’.¹⁸⁹ It is the ‘true first’, and has a being ‘due to itself alone’,

because it is how the idea first becomes real and alive to us, and this is not just a summation of the two preceding processes, therefore *containing* them, but a *transformation* of them into something new. There may be a parallel here with the idea of a ‘coherent superposition’ in quantum physics, which is something in itself distinct from its components, as its components are one from another.¹⁹⁰

There may also be a similarity here, at least in part, with Cusanus’s dialectic of *explicatio*, or unfolding of the implicit into the created world; and *complicatio*, its enfolding in God. In this *mythos*, the infinite enters into the finite, the transcendent becomes immanent: and thus the finite is equally taken up into something greater than itself. These phases are not merely historical, but continuous and eternal. This takes us back to Eckhart’s idea of a continuous incarnation. Such constriction of the divine within the finite is a central theme of the Christian incarnation: in the words of the carol, ‘For in this rose contained was / Heaven and earth in little space; / *Res miranda*’. And so Donne, addressing the Virgin, marvels at ‘immensitie cloysterd in thy deare wombe’.

Here again we see the creative nature of negation. The Chabadic understanding of *tzimtzum* is that in order to say anything at all, one must select one thing out of all that one knows: thus the totality of one’s knowledge remains, yet the utterance is simple and single. In other words a limiting or filtering process is required for something to come into being; but that does not negate the ‘immensitie’. Immediately parallels come to mind: it is that limiting of potential which causes the single observable event, when the wave function collapses into a particle; James reminds us that it is the limiting constriction of his vocal cords that shapes the limitless air into ‘my personal voice’; and it is in this sense that I have argued that the brain constrains the field of consciousness to cause personal experience, and allow us the freedom to influence the course of events. The fourteenth-century Persian mystic poet Hafiz wrote: ‘I am a hole in a flute that the Christ’s breath moves through.’¹⁹¹ (Note that for Hafiz there was no insuperable divide – quite the opposite – between Christ and Mohammed.)

Creative negation is not only imaged in the first phase of divine contraction, *tzimtzum*, but also in the existence of the constraining vessels in the second phase: paradoxical as it may seem, such constriction is the only way that God, or *Ein-Sof*, may enter into, be received by, and understood by, his creation. This has deep resonances with the Christian doctrine of

what is called kenosis, the self-renunciation, or ‘self-emptying’ of the divine nature in the act of incarnation.

THE HEMISPHERES AND OMNIPOTENCE AND OMNISCIENCE

There is a further aspect of divine constraint that I want to suggest. This relates to the attributions of omnipotence and omniscience.

As conceived by the left hemisphere, a religion is likely to emphasise power and certainty above all. There is little room in its monolithic structures for the freshness of creation and the vulnerability that alone makes love possible. To me, this is a misunderstanding of the nature of religion.

For what it is worth, I do not believe in a God of love who is also omnipotent and omniscient. I am encouraged by the fact that once again William James was there before me. In a letter to a friend, he wrote: ‘The “omnipotent” and “omniscient” God of theology I regard as a disease of the philosophy-shop.’¹⁹²

But I recognise the likelihood of my being misunderstood. Not to be omniscient and omnipotent sound like failings in a God. I cannot believe that God is either omniscient or omnipotent: but I also think God is not ‘*not* omniscient’, and not ‘*not* omnipotent’. It’s that the terms just don’t apply. (Similarly it would be equally baseless to claim that God is green or not green. The terms are misconceived.)

To know, according to the left hemisphere, is already to have something fixed and represented in memory – pinned down. To have power, similarly, is to have the ability to interfere in the course of things and manipulate an intended outcome: that is, after all, the left hemisphere’s *raison d’être*. They are both aspects of the need to *control*: but if there is to be veritable creation, creation must be *not* wholly under the creator’s control. We are thinking in the wrong way, if we think like this about God. For neither power nor knowledge is only of this kind.

God is not in a left hemisphere sense, but in a right hemisphere sense, all-knowing and all-powerful. Knowledge, as understood by the right hemisphere, is a process of openness and receptivity in which two entities progress ever closer to one another through experience. *Kennen*, not *wissen*. In this sense, God alone has knowledge of everything, whereas we have knowledge of only that limited part of reality that we can encounter. If God

were to know everything, in the sense of ‘knowing the facts’, God would be importantly limited, because then Creation could no longer be truly free and with that the possibility for love – which depends on the free will of a true Other – would be lost. As Max Scheler has it, ‘even God is not party to an unconscious ecstatic foreknowledge of His own coming-to-be’.¹⁹³

And power? Power as understood by the right hemisphere is *permissive*: creative power, the power to allow things to come into being, precisely by underwriting the existence of a creative field, but *not* interfering and manipulating within it. Not making things happen according to *fiat*, but allowing things to grow. That is true creation. I am reminded of the story of the Tibetan Buddhist monk who carried on serenely praying as Chinese soldiers ordered his fellow monks out of the monastery at gun point. A soldier roughly prodded him with the butt of his rifle, and told him to get up and get out, shouting ‘Don’t you know that I have the power to kill you?’ The monk looked up and replied, ‘Don’t you know that I have the power to let you?’ Semantics, you may say. But I think it is much more.

There is an ambiguity to the account of the creation in Genesis. Each act of creation is initiated by God saying ‘let’ something come into being. This can be seen as a command, exercising controlling power, but as I have already suggested this is at odds with the idea of a free creation which God ‘saw’ for the first time as it came into being. I would suggest that it could also be seen as evocative – not even permitting, but actually calling something into being. This idea is enshrined in other creation myths, such as that of the Mayan people: the primal gods also speak the world into being – they say ‘mountains’, and mountains emerge, ‘as if the mountains were there in the primordial world all along and were revealed, little by little, as the clouds parted.’¹⁹⁴

In a slightly different and more profoundly paradoxical take on God’s constraint the twelfth-century kabbalist Azriel of Gerona argues that God must have both infinite and finite powers, since if one supposes ‘that [*Ein-Sof*] has unlimited power and does not have finite power, then you ascribe imperfection to his perfection.’¹⁹⁵ This is not just sophistry. An all-embracing power embraces limitation; a creative force requires an element of resistance. Jordan Peterson refers to a commentary on the Torah: ‘Imagine a Being who is omniscient, omnipresent and omnipotent. What does such a being lack? The answer? *Limitation*.’ And he continues:

If you are already everything, everywhere, always, there is nowhere to go and nothing to be. Everything that could be already is, and everything that could happen already has. And it is for this reason, so the story goes, that God created man. No limitation, no story. No story, no Being.¹⁹⁶

And no Becoming. I would say that it is for this reason that God created – full stop. And if God has initiated a process that generates what is genuinely new, genuinely free – a process of truly creative evolution – why would God destroy it by omniscience and omnipotence? That the divine mind contains all possibilities, does not imply knowledge of which particular possibilities will be actualised.

God is not like a human agent performing acts of *will*. The sun does not will to shine, nor can we will it to shine: it always shines, and it is only the presence of cloud that obscures it. We need, then, to be in a state of highly active passivity, or ‘active receptivity’¹⁹⁷ – what Freya Stark calls, in an even better phrase, ‘fearless receptivity’.¹⁹⁸ So it is that Meister Eckhart says:

Do not imagine that God is like a human carpenter, who works or not as he likes, who can do or leave undone as he wishes. It is different with God: as and when God finds you ready, He has to act, to overflow into you, just as when the air is clear and pure the sun has to burst forth and cannot refrain.¹⁹⁹

This is remarkably like Scheler’s understanding of human awareness of reality in general, that it is a process of saying no, or *not* saying no. We do not know what we are saying ‘yes’ to until we encounter it, so the most we can do is decide not to say ‘no’ to whatever it is that is coming into being.

God, however, unlike us, can say ‘yes’. And to say ‘yes’ to everything includes *saying ‘yes’ to ‘no’* – limitation – which may explain the existence of sin. But equally, if the spirit of evil says ‘no’ to everything – Goethe’s Mephistopheles says ‘*Ich bin der Geist der stets verneint*’ (‘I am the spirit that always negates’) – this must include *saying ‘no’ to ‘no’*, which is why the force for negation has the potential to be turned to good. This aligns itself closely with the *coincidentia oppositorum* theme of Chapter 20.

In the *Tao Te Ching*, it is said that ‘being and non-being produce each other’.²⁰⁰ The Chinese is notoriously such that it cannot be pinned down to just one interpretation. In this word-form it seems peculiarly abstract. The insight behind this saying, it seems to me, is one that I have touched on repeatedly; that creation is the precipitation of something out of unlimited potential into limited actuality, which then inevitably interacts further with potential, in such a way that potentiality influences what is further actualised. In other words, there is a continuous reciprocity or calling-forth between the potential and the actual, the unbounded and the bounded, in Whitehead’s terms between God and the World, each helping to shape the other. This meaning is perhaps more apparent in another translation: ‘what is and what is not create each other’.²⁰¹

Yet another translation, which refers more obviously to hemispheric interplay, is ‘the hidden and the manifest give birth to each other’.²⁰² Note, not just that the hidden gives rise to the manifest (since the left hemisphere draws on the right), but that the manifest at the same time gives rise to the hidden (the right hemisphere receives what the left hemisphere produces, taking it up again into an implicit whole). Goethe’s ‘holy open secret’ is, like the divine, both everywhere manifest and everywhere hidden. Of *Ein-Sof*, which unifies within itself being and nothingness, Azriel remarks that it ‘is the essence of all that is *concealed* and *revealed*’.²⁰³ And for Luria, according to Sanford Drob,

God does not create the world through a forging ... of a new, finite, substance, but rather through a contraction or concealment of the one infinite substance, which prior to such contraction is both ‘Nothing’ and ‘All’. Like a photographic slide, which reveals the details of its subject by selectively filtering and thus concealing aspects of the projector’s pure white light (which is both ‘nothing’ and ‘everything’), *Ein-sof* reveals the detailed structure of the finite world through a selective concealment of its own infinite luminescence. By concealing its absolute unity *Ein-sof* gives rise to a finite and highly differentiated world.²⁰⁴

This is Shelley’s ‘dome of many-coloured glass’, staining the white radiance of eternity. And the sense in which negation is creative is bodied

forth at various levels in the structure of the brain: the creation of the brain by the paring away of neurones on a colossal scale even before birth; the continual pruning of synapses over a lifetime; the inhibitory relationship between frontal and posterior cortex, and between the cortex and subcortical regions; the unveiling of savant skills through damage to the brain or through selective suppression of parts of the frontal cortex; and the mutually inhibitory relationship between the hemispheres. The brain, in other words, is a process of sculpture – indeed, auto-sculpture. And the creation of *individual* consciousness comes about, I believe, as I have explained, by the permissive action of the brain.²⁰⁵

Meister Eckhart says that God negates negation.²⁰⁶ Indeed he says that One Itself is the negation of negation (*unum ipsum negatio negationis*):

Here Eckhart says that the unity appropriated to the Father is nothing other than ‘the negation of negation which is the core, the purity, the repetition of the affirmation of existence’ ... God as *negatio negationis* is simultaneously total emptiness and supreme fullness.²⁰⁷

As mentioned, the philosopher and Christian mystic Jakob Boehme called the ultimate ontological ground of the cosmos the ‘unground’ (*Ungrund*). And we saw that, according to the Lurianic Kabbalah, the primal ground of Being (*Ein-sof*), brought about the created cosmos by an act of withdrawing, or self-abnegation, known as *tzimtzum*. According to the *Tao Te Ching*, the *tao* is ‘the deep source of everything. It is nothing, and yet in everything’²⁰⁸. And according to mathematician and philosopher William Byers, the ancient Indian idea of *śnya*, which is behind the Buddhist philosophy of emptiness,

has two self-consistent but mutually incompatible meanings. For other civilisations (such as the ancient Greek), the idea of ‘nothing’ has only the negative connotation of absence. It is a triumph of Indian civilisation that it manages to look at nothing as this self-contradictory concept, give it a coherent meaning and even symbolic representation.

In other words, the Indian invention of the concept of zero, on which modern science and mathematics is dependent. Zero thus contrives to be both a non-entity and an entity:

the power and importance of a concept such as ‘zero’ may be proportional, not to its properties of harmony and consistency, but to the inner contradiction to which it gives form and by so doing resolves in some way. Thus the important thing about ‘zero’ is precisely its inner contradiction.²⁰⁹

The relation between Being and Nothing is something Hegel repeatedly confronted: ‘The truth of Being and of Nothing is accordingly the unity of the two: and this unity is Becoming ... Becoming is the unity of Being and Nothing.’ And, moreover, ‘Being and Nought are empty abstractions ... Becoming is only the explicit statement of what Being is in its truth.’²¹⁰ If one thinks of Zeno’s paradox of the arrow, the options Zeno considered were for the arrow to ‘be there’ at some point, or ‘not to be there’ – being or nothing. But the *flight* of the arrow is a becoming: it really *is* becoming. It is never just there absolutely (being) or just not there at all (nothing), which are purely theoretical abstractions, merely *post hoc* representations of the living flow in such a way as to be grasped by the left hemisphere.

Hegel went on to emphasise that Becoming is not only the unity of Being and Nothing, but ‘also inherent unrest – the unity ... which, through the diversity of Being and Nothing that is in it, is at war within itself.’ By contrast brute Being, ‘all that “is there and so”’, as he puts it, is ‘one-sided and finite.’²¹¹ And essentially dead. Elsewhere he wrote that it was ‘one of the fundamental prejudices of logic as hitherto understood and of ordinary thinking’ that contradiction was less essential than sameness (identity). However, if one had artificially to separate them, and to say which was more essential,

contradiction would have to be taken as the profounder determination and more characteristic of essence. For as against contradiction, identity is merely the determination of the simple immediate, of *dead* being; but contradiction is the root of all

movement and *vitality*; it is only in so far as something has a contradiction within it that it moves, has an urge and activity.^{[212](#)}

I quoted earlier Schelling on the cosmos: ‘this whole construction begins with ... a *dissonance*, and *must* begin this way.’ It is the tension between what one is and what one has it in one to become that gives rise to purpose. It is the tension in the bow, the tension in the string of the lyre, that gives it power to let the arrow fly, to let the music live.

Azriel of Gerona, writing in the twelfth or thirteenth century, was perhaps the first kabbalist to clearly articulate the doctrine of *coincidentia oppositorum*. He makes the point that the nature of the *sefirot*, the emanations from the divine that sustain creation, is a synthesis of every thing with its opposite: ‘for if they did not possess the power of synthesis, there would be no *energy* in anything.’^{[213](#)}

IS GOD UNKNOWABLE?

Can we know God? ‘In theological matters negations are true and affirmations are inadequate’, wrote Cusanus.²¹⁴ On the other side of the ‘step across’ from the everyday realm in which we are contained by left hemisphere thinking, whatever is encountered – not just God – can be expressed only in terms of what it is *not*. The language-defined left hemisphere sees the world as the opportunity to *do*, to manipulate. It can’t deal adequately with whatever refuses such manipulation. It can handle such elements only by expressing them as the negation of something it has already, to its satisfaction, established. It is as if life were referred to as undeath, giving in itself no idea of what life is like – except that it is not death. So we say the *infinite*, we call things *indivisible*, we refer to *non-quanta* – we simply have no positive terms in the realm of ‘beyond’: all is defined by what it is not. I find that in itself revealing. According to Cusanus, whose thinking about God was couched in terms of mathematics and geometry: ‘A finite line is divisible, and an infinite line is indivisible; for the infinite, in which the maximum coincides with the minimum, has no parts.’²¹⁵ (Division, as we have seen, is the operation of the intellect reducing things to parts.) Cusanus saw God as like the circumference of a circle that even an infinite number of straight lines can only approximate, but never finally achieve (see Fig. 37). It is not just language, but mathematics, that declares its own limitations here.

Ein-Sof, literally means ‘no limitation’, therefore ‘the infinite’. And at times the name is reduced simply to *Ein* (‘Nothing’).²¹⁶ The source of Being, then, is also No-thing. The mediaeval Spanish kabbalist Joseph Gikatilla had this to say:

The depth of primordial being is called Boundless. Because of its concealment from all creatures above and below, it is also called Nothingness. If one asks, ‘What is it?’, the answer is, ‘Nothing’, meaning: ‘No one can understand anything about it’. It is negated of every conception. No one can know anything about it – except the belief that it exists. Its existence cannot be grasped by anyone other than it. Therefore its name is ‘I am *becoming*’.²¹⁷

Or 'I will be what I will be'. The freedom is in the unknowing and undetermined becoming of God, but therein lies also the freedom of God's creation. In the Kabbalah, the cosmos and God are, as in so many of the great *mythoi* of the world, reflected in one another: as above, so below. And in the human soul, too, there is this salvific emptiness. The existence of human free will is the ultimate expression of *tzimtzum*, the 'standing back' of God.^{[218](#)}

All that matters most to us can be understood only by the indirect path: music, art, humour, poems, sex, love, metaphors, myths, and religious meaning, are all nullified by the attempt to make them explicit. This is the right hemisphere's preferred territory; and, beyond that, the right hemisphere is more capable of holding together apparently conflicting positions (as the left hemisphere would see them); it's more at ease with the idea that both of two viewpoints are necessary. Such ambiguities and 'conflicts' of meaning or reasoning lie at the core of the mystical religious tradition, which is notoriously reliant on paradox to convey truths that transcend our everyday understanding. And we are now discovering the same necessity in science.

Mystery does not imply muddled thinking. On the other hand, thinking you could be clear about something which in its nature is essentially mysterious *is* muddled thinking. Nor does mystery betoken a lack of meaning – rather a superabundance of meaning in relation to our normal finite vision. Philip McCosker puts it well, taking a homely example that speaks to each one of us:

I know I was born and will die and that knowledge is mysterious, in the way that knowing that one is in love is mysterious: the mysteriousness of both cases does not primarily or easily lie in a lack of knowledge, for it is the knowledge itself that is mysterious.

It represents, he says, a 'tense conjunction of knowing and unknowing'.^{[219](#)}

This transfers our attention from knowing in an intellectual, above all linguistic sense, to knowing in the sense of experience. Most people who believe in the divine would say that their belief is a matter of experience rather than ratiocination, and that the experience is hard indeed to

communicate – like attempting to communicate the taste of pineapple to someone who has never tasted it – but nonetheless carries conviction for the one that experiences. To quote the Psalms: ‘O taste and see how gracious the Lord is’.²²⁰ If you want to know how pineapple tastes, you have to eat it: and obviously the deep analogy implied here is with the nature of love.

In Chapter 26, I suggested that love is not just a product of value, but might be considered itself a value; and that, like the other values I have discussed, such as truth, beauty, goodness, and purpose, it is foundational. By that I mean that it does not emerge from something else, but is an irreducible aspect of the cosmos, and in that sense an ‘ontological primitive’. Here we approach an area in which, it could be argued, we may find it more reasonable to speak of the divine than not. If we accept that, then such values become no longer separate individual primitives, substantive elements, but adjectival, qualities – but of what? Of the one ontological primitive, namely God. Rather oddly, it seems more acceptable among philosophers (and Iris Murdoch is a case in point) to speak of ‘the Good’ than of God, as though it were a matter of education, if not of good manners, to steer clear of any whiff of divinity. At the same time quite how Murdoch’s idea of the Good differs from God is unclear. Substantivizing qualities was arguably an accident of the Greek language’s invention of the definite article – no longer having only the adjective *καλός*, it became possible to speak of a noun, *τὸ καλόν*. One then has a number of ‘unmoored’ (no pun intended) properties to account for. Derek Parfit was a ‘naturalist’ in the sense that he did not believe in aspects of reality that go beyond a scientific account in the broad sense; yet he took an objectivist view of values, which he saw as irreducible properties. Again it remains unclear what, for him, sustains such values ontologically. While invoking God does not, as I say, answer our questions, it is part of a picture – a *Gestalt* – that makes more sense to me as a whole than a *Gestalt* that avoids the divine. But I readily accept that here we reach, as so often, a point at which language hinders rather than furthers understanding. How are we to express the *sui generis* in language, and what does it add if we do so? We can only keep returning to experience.

This problem of how to comprehend a whole that is *sui generis* is not a form of special pleading, and it is not just a problem in approaching the divine. It has a precise analogy in physics. ‘It remains a great temptation to

take a law or principle we can successfully apply to all the world's subsystems and apply it to the universe as a whole', writes Smolin.

To do so is to commit a fallacy I will call the *cosmological fallacy*. The universe is an entity different in kind from any of its parts. Nor is it simply the sum of its parts. In physics, all properties of objects in the universe are understood in terms of relationships or interactions with other objects. But the universe is the sum of all those relations and, as such, it cannot have properties defined by relations to another, similar entity.^{[221](#)}

Nicholas of Cusa made the same point in the fifteenth century, in respect of infinity. It is intrinsically unknowable because there is no comparison: 'Therefore, every inquiry is comparative and uses the means of comparative relation ... Hence, the infinite, qua infinite, is unknown; for it escapes all comparative relation.'^{[222](#)}

Here the account of artists, poets and composers seems to me of interest. The poet Gregory Orr writes:

One of the terms we poets use in our considerable effort to avoid religious and spiritual terminology is 'beautiful'. Of course no one can define the word, or everybody defines it differently, and yet we believe in it. Beauty is an article of faith among poets. I think many of us are trying to sidestep religion, and beauty is a word we use to do that.^{[223](#)}

Beauty speaks directly to us of something beyond, an idea that is at the core of all Hopkins' poetry. When we are in the presence of Taverner's Kyrie 'Leroy', or one of Fra Angelico's annunciations (he painted at least four), it is not just beauty we experience but the strangeness of another realm. 'The encounter with the aesthetic', writes George Steiner,

is, together with certain modes of religious and of metaphysical experience, the most 'ingressive', transformative summons available to human experiencing. Again, the shorthand image is that of an Annunciation, of 'a terrible beauty' or gravity breaking into the

small house of our cautionary being. If we have heard rightly the wing-beat and provocation of that visit, the house is no longer habitable in quite the same way as it was before. A mastering intrusion has shifted the light (that is very precisely, non-mystically, the shift made visible in Fra Angelico's Annunciation).'^{[224](#)}

NEGATION AS CREATIVE

Such experience is the only positive knowledge we can have. But, like the *tzimtzum* of *Ein-sof* in creating the cosmos, there needs to be an emptying out, a receptive space so as to make a place for it to live: a primary act of negation.

I have repeatedly emphasised the creative role of reciprocal inhibition in the brain. And I have discussed Heidegger's saying '*Das Nichts selbst nichtet*', and the relation between Nothing and Being. In the Kabbalah, '*Keter*'s very negativity is what brings all of the succeeding *sefirot* into being. This negativity is, in fact, the essential manifestation of the primal will.' ²²⁵

Moreover, the *sefirot* comprises ten powers or principles; and for the cosmos to be at all, both the principle of love (*chesed*), and the power of restraint (*gevurah*), are required. At one level they are opposites, but, at another, each is vitally needed for the fulfilment of the other. It is only with the restraint of *gevurah*, which is made evident in the phase of creation called *tzimtzum* (divine withdrawal), that finite creatures can subsist *without being reabsorbed into Ein-Sof*. Neither principle alone could sustain creation. It is only through their tension and complementarity, one dividing, the other uniting, that a world can come into being at all. ²²⁶ Human flourishing, too, depends on remembering this wisdom. To be secure, children need boundaries and discipline as well as acceptance and unconditional love; for the mature adult, there needs to be a proper balance between self-acceptance and self-criticism, the taking of responsibility and self-forgiveness: permission and constraint. ²²⁷

Although it might have seemed puzzling at the time, I have throughout emphasised that some degree of resistance, of negativity, is necessary to creation: Heraclitus' 'war', Hegel's antithesis. The divine creation is the archetype of creation, so we must expect it to apply there, too: in *tzimtzum*, and in the Christian idea of the Incarnation. I suggest that this is why it involves the recalcitrance of matter, as well as the freedom of the spirit; processes of constriction and permission as much as of liberation and generation; division and differentiation as well as union and the formation

of new wholes. It is out of the conjunction of 'all is one' and 'all is not one' that everything arises. I find this in Kolakowski:

... the original eruption of creative energy must begin by erecting obstacles to its further expansion: in order to organise conditions for a freedom other than his own, God had to produce matter, in which he subsequently finds an eternal foe; matter is both the condition of the movement of life and a resistance to be overcome. ²²⁸

Negation is not just a limit on freedom, but is *itself* liberating. Too ready a foreclosure on certainty destroys the suspended space in which creation alone can come to being: we need Keats's 'negative capability'. Wordsworth knew this and much of his poetry depends on the suggestion of possibility by negatives and comparatives. His most famous short poem begins with both: 'Earth hath *not* anything to show *more* fair'; but it is everywhere in his work, opening up to possibility by negating what our mind first grasps hold of: 'thoughts of *more deep seclusion*', 'with *some uncertain* notice, as *might seem* of *vagrant dwellers* in the *houseless woods*', and so on. Absences, comparatives. Comparisons open up possibility by suggesting what is *not* the case: this is not what you might think 'deep' to mean, the grammar seems to say, but something still 'more deep'.

And negation can imply a whole background, a whole depth in time, that affirmation could never achieve so economically. How is that possible? Pushkin's wonderful long poem *Yevgeny Onegin* begins: 'When my uncle, a man of principles, fell ill *ne v shutku* ...' *Ne v shutku* means 'not in jest'. So, 'seriously', then? It won't do at all: 'fell seriously ill' happens to convey a truth, but the least important part of the truth. Because the point is that the uncle was a tedious old hypochondriac, a valetudinarian who was always crying wolf and keeping the family at his bedside, cooling their heels: and, then, at last he really was ill. Only the formulation '*not* in jest' conveys all of this picture in one little phrase.

The constant emphasis on the ungraspability of God may have left the impression that God is something remote, intellectual, and abstract. But everything is paradoxical here: because God is also the least of all these things. One of my favourite sayings, because it answers to experience exactly, is from the palaeontologist and priest Pierre Teilhard de Chardin:

By means of all created things, without exception, the divine assails us, penetrates us and moulds us. We imagined it as distant and inaccessible, whereas in fact we live steeped in its burning layers.²²⁹

You cannot get less remote, intellectual or abstract than that. The divine is not a realm transcending life, but an aspect of life itself. When Jacob awoke from his dream, he realised that God was ‘in *this* place, and I knew it not.’²³⁰ Once again, it is a matter of seeing exactly where we are, but with different ‘eyes’ – or, in terms of the hemisphere hypothesis, from a point of view from which the right hemisphere is not excluded.

There is, furthermore, no conflict between reason and religion. Belief is not the antithesis, but the complement, of reason; not the opposite of knowledge, but its inevitable basis – and its outcome.

Though a belief in God or otherwise cannot be a matter of argument, there is nonetheless virtue in having a sort of scaffolding in place, even though it cannot reach heaven. The scaffolding won’t do the job, but it will be reassuring to those who are wont to arrive at truths by erecting scaffolding (or so they believe). People have to start from where they are at the time, and many can’t get past the first hurdle: that they believe the idea of God is an affront to the rational mind. But, though there are many paths that may lead to God, I can’t believe any of them does so in a coercive fashion – one that leads someone to say, ‘OK, I give in, there is a God’. That you must always be free to choose, and free to doubt, seems to me part of the deal. (If you believe we are not free, then beliefs, including that one, don’t matter, since they are merely predetermined.) What does love mean, to the lover or the one that is loved, if it is compelled?

I have throughout this book suggested that the cosmos is not an unfolding of something already present in its origins, but a free process of true and original creation, not foreknown, not even to a God, if there is one. And similarly there was no necessity for there to be a God (though given that there is anything at all, it arguably becomes highly probable). There was no necessity for there to be anything at all. Being is mysteriously unnecessary. As Meister Eckhart put it, being is God’s idiosyncrasy.²³¹

On the lines of what might be possibly persuasive, rather than coercive, let me put to you my version of Pascal’s Wager. Pascal, one of the world’s greatest mathematicians and theorists of probability, contended, you will remember, that it is not just wise, but rational, to believe; because if there is

no God, faithfulness does no harm, and possibly some good; whereas if there is a God, and you don't know him, you're lost. As a teenager, I used to be troubled by the question whether one can will what one believes; but since I came to see that belief is dispositional, not propositional, that difficulty was overcome. Pascal advised us not to begin from propositions themselves but from adopting a way of life that embodies the disposition we seek to emulate: practical, embodied wisdom of the highest degree.

Logic dictates that one takes into account not just the likelihood of an outcome, but the cost of failing to have prepared adequately for it should it occur. Since the cost would be extraordinarily high – we don't know how high that would mean, but we know the reality of suffering – and since God is certainly not a vanishingly unlikely possibility, what is more logical? Moreover, to decide is not just a matter of weighing propositions: I have all along emphasised that truth in this area is something one can find out *only* by experience, by seriously acting 'as if'.

So what is McGilchrist's Wager? For me, Pascal's doesn't quite cover the bases. That's because I don't think this is necessarily a matter of 'either/or'. If you accept that God is in process, as is the cosmos, there is an important third option, much more significant than either of the other two. With Pascal's Wager, there just *is* a state of affairs, which we either recognise or do not; we cannot play any part in its coming about. But if it is true that the cosmos depends on us to become what it is, there are three possibilities, not two. Either – as with Pascal – there just is a God, and all depends on our recognising him; or – as with Pascal – there just isn't a God, in which case nothing is lost by believing; or (*per* McGilchrist) if God is an eternal Becoming, fulfilled as God through the response of his creation, and we, for our part, constantly more fulfilled through our response to God; then we are literally partners in the creation of the universe, perhaps even in the *becoming of God* (who is himself Becoming as much as Being): in which case it is imperative that we try to reach and know and love that God. Not just for our own sakes, but because we bear some responsibility, however small, for the part we play in creation (and indeed how 'big' or 'small' we cannot know: the terms are derived from our limited experience of a finite world).^{[232](#)}

Since the atheist cannot be logically certain of his lack of belief, and since one cannot rule out that the consequences of being mistaken about this are as great as anything can be – for the atheist, an encounter with God

in whatever happens after death might be seen as the ultimate Black Swan event – the rational path is clear. Pascal's limited Wager still applies; but if the nature of reality is not already fixed, but, rather, evolving, participatory, reverberative, it is both rational and important to open your mind and heart to God, in order to bring whatever it is evermore into existence.

Of course, the nature of reality may be unalterable, and the universe may be mechanistic, as some claim. In such a case, it would still be better to believe, because of the good effects of belief locally.²³³ Some will say, 'but I can't take steps to *believe*: it all seems to me like a childish fairy tale – it's just not true'. I am immensely sympathetic to this, because I, too, believe truth has intrinsic, not just instrumental, value. But my question, then, is this. Bearing in mind what is at stake, if you think people simply cling to religion for comfort, why is it that your truth is so much more important than their happiness? I think you are right to believe that it is. But why would *you* think so? In a meaningless universe, shouldn't utility alone count? Where does the sacrosanct nature of truth come from, and what does it matter, in an intrinsically amoral universe?

Here I think of the saying of Meister Eckhart: 'God loves the soul so deeply that were anyone to take away from God that divine love of the soul, that person would kill God.'²³⁴ And in another place: 'God loves my soul so much that his very life and being depend upon his loving me, whether he would or no.'²³⁵ In some sense God's very existence, says Eckhart, expressing it, of course, in such a way as to create maximum effect, depends on loving us (as does ours on loving God). Could it make sense to consider that this union might even be ontologically prior to those that in it are unified – the relation prior to the *relata*? Love is a relationship. That would mean God and the soul do not produce, but are manifestations of, the same love; the logical consequence being that if you take away the love of the soul you take away God, as well as taking away the soul.

A hungering for certainty and the desire to over-clarify are allied to literalistic thinking. They can afflict believers and atheists alike. Too great a need for precision crystallises our thinking, fixes our path, too early – and thus leads us astray. 'He who thinks greatly must err greatly,' wrote Heidegger.²³⁶ The need to be right at every step often deceives and leads astray. Instead we need to be more alert and attentive, like a tracker or hunter. 'Everything here is the path of a responding that examines as it listens', he wrote. 'Any path always risks going astray ... Stay on the path,

in genuine need, and learn the craft of thinking, unswerving, yet erring.’²³⁷ Never to err is for the gods alone.

Approach to the divine involves living with a ‘cloud of unknowing’; but there is also a ‘cloud of knowing’, which leads many people astray: ‘the pride connected with knowing and sensing lies like a blinding fog over the eyes and senses of men’, as Nietzsche says.²³⁸ They fail to attend to that sense that is in all of us, because they already think they know for certain it can’t be right. That is their faith.

Unknowing could be thought of as what happens when we transcend analysis. ‘We experience more than we can analyse’, wrote Whitehead. ‘For we experience the universe, and we analyse in our consciousness a minute selection of its details.’²³⁹ Analysis *on its own* not only fails to see most of the picture – just ‘a minute selection of its details’ – but removes the connexions between what we take to be ‘things’, and deceives us into thinking that this is how we come to know what they are: it is the very connexions, not the things, that constitute reality. Analysis also tends to focus attention on the immediate and salient – the obvious – ignoring the background. According to Takahiko Masuda & Richard Nisbett, who have written widely on culturally divergent thinking styles, whereas East Asians tend to view the world by attending to the entire field and the relations among objects, Westerners tend to view the world analytically, focussing on the attributes of distinct, salient objects. East Asian cultures, preferring holistic thinking, require ‘the active suppression of analysis, and *not* attending solely to focal stimuli, but rather actively attending to both focal and contextual information’.²⁴⁰ Notice that holistic thinking is already a ‘both/and’. It is its nature to include its opposite. There is nothing wrong in itself with analysis; it is often a useful staging-post, but should never become the journey’s end. Taking a point of view that is unbalanced towards analysis *only*, we tend to see the choices as *either* details *or* whole – and have, as could be predicted, chosen details.

Sequential analysis will never succeed in revealing truth in areas such as that of the sacred and divine. It would be like trying to tell whether the sun is shining by listening for the sound it makes. CL Miller warns the reader that ‘Cusanus’s thought has to be viewed as a whole, for it works more by correspondences and parallels between the domains he is interested in expounding than in a linear fashion or by direct argument.’ This is despite the fact that nowadays the common prejudice is that a scientist and

mathematician such as he was would be sure to construct analytic arguments. However his intelligence was synthetic, as much as it was analytic, and it was precisely this that enabled him to have the many insights, across so many fields of knowledge, that he had (see Appendix 8).

Reason is wholesome, and by no means leads necessarily to atheism. But it remains true that by focussing too much on reason we miss all the things that can't be reasoned about, or precisely expressed – only alluded to. One might make a distinction between what is irrational (against reason) and what is 'suprarational' (beyond reason). Music might act as an everyday example of something very real, possessed of deep meaning, and not irrational, but suprarational. 'The whole world lies, so to speak', says Schelling, 'in the nets of rationality and reason; but the question is, *how* exactly it got into these nets, since there is obviously something other, and something *more*, than mere reason in the world – indeed something that actually strives outwards, beyond its bounds.'²⁴¹

How *did* it get into those nets? My answer is contained in the second half of *The Master and his Emissary*. It involves, at some level, hemisphere imbalance in the history of the Western World. But let me turn now to what happens to the sense of the sacred when the left hemisphere ceases to be a faithful servant, and takes it upon itself to be Master.

LUCIFER REBELS: WHEN THE LEFT HEMISPHERE ASSUMES MASTERY

When the left hemisphere acts as servant its assistance is often invaluable. We have seen in this chapter its role in helping fashion coherent propositions out of an intuitive disposition, that of wonder at the mystery of Being. But in the end it is the right hemisphere that understands. As Heschel put it, *halakhah* and *aggadah* are both needed, but *aggadah* grounds *halakhah*. We saw in Part I how the left hemisphere is less reliable, by comparison, even in the mundane exercise of navigating our way through daily life. And we have also seen what happens when the servant assumes the role of master, and the left hemisphere arrogates to itself, as it so often tries to do, the right hemisphere's role, that of understanding.

In relation to understanding the divine, the left hemisphere usurps the role of the right in two apparently opposed, but remarkably similar ways. In one it appropriates the tentative speculations of uncertain theology, faith that is always imbued with doubt, and turns them into dogmas and unbending moral codes of 'true' or fundamentalist religions. In the other, it denies everything. It excludes from its hall of mirrors all that the right hemisphere intuits about the ground of Being and declares there is no God. Both are rejections of the critically important need to remain open. Both are forms of Lucifer's rebellion.

Religious dogmatism

The first is a transformation of religion, whereby it becomes a matter of certainties, in the process, at the outset, losing what is arguably its central quality. Matters of great subtlety that defy language are replaced by linguistic doctrines of great complexity. The Christian doctrine of the Trinity, for example, an ancient mystical concept with pre-Christian origins,²⁴² became the ground – or perhaps more accurately the pretext – for disputes about the relationship between the persons of the Trinity that drove the Western and Eastern churches apart for over a thousand years.²⁴³ I do not mean to suggest that in such superficially superficial disputes there are not serious intellectual issues worthy of exploration and debate; but that

an obsession with truth-as-correctness and a focus on detail – both characteristic of the left hemisphere's approach – result in a loss of the more important vision enshrined in the Christian *mythos* of which the Trinity forms part. The proper part played by the doctrine of the Trinity is explained by the theologian Jürgen Moltmann in his Gifford lectures:

The trinitarian concept of creation binds together God's transcendence and his immanence. The one-sided stress on God's transcendence in relation to the world led to deism, as with Newton. The one-sided stress on God's immanence in the world led to pantheism, as with Spinoza. The trinitarian concept of creation integrates the elements of truth in monotheism and pantheism. In the panentheistic view [my emphasis], God, having created the world, also dwells in it, and conversely, the world which he has created exists in him ... the de-divinisation of the world has progressed so far that the prevailing view of nature is totally godless, and the relationship of human beings to nature is a disastrous one. This means that today we have to find an integrating view of God and nature which will draw them both into the same vista. It is only this that can exert a liberating influence on nature and human beings alike.²⁴⁴

The extraordinary power of the Christian mythos lies in its central idea of incarnation – the intimate relationship between consciousness and matter, and the core idea of panentheism. Yet focus on minutiae coupled with a need to be right (both left hemisphere tendencies) explains the fissiparous nature of religious groupings – and, for that matter, identity-conscious groups anywhere in politics: immortalised in *The Life of Brian* as the dispute between the People's Front of Judaea and the Judaeans People's Front.

When the left hemisphere predominates, the space of unknowing in which spiritual life flourishes comes to be replaced by dogma; openness by contention; tolerance by self-righteousness; forgiveness by stigma; orderliness by legalism. There emerge steep hierarchies. Fundamentalism insists that the truth lies in a written word, a holy book; whatever wisdom the book enshrines no longer seen as the work of variously inspired, yet fallible, humans, but of a divine hand; taken out of its historical setting and

viewed as absolute; conferring on its adherents the possibility to be finally right, and those who doubt them unquestionably wrong. Truth indeed changes its nature, and becomes simplistic, literal, stateable and knowable, explicit and abstracted from context. The body becomes no longer the best image of the human soul, in Wittgenstein's phrase, but the soul's prison and antagonist. Representations come to replace the living presence they purport to represent (see the commentary on the Reformation in *The Master and his Emissary*).²⁴⁵ Codes of conduct lose contact with their primary source in life and become bafflingly recondite: the Talmudic tractate *Shabbat*, for instance, identifies 39 categories of activity prohibited on the Sabbath day, one of which includes drawing the bones out of fish, though drawing fish off the bone may be permitted as long as the fish is to be eaten immediately, and no utensil was used in the process (there are many fine points of interpretation). Again, I mean no disrespect to the pious, but simply to illustrate a trend towards the triumph of form over content.

Fascinatingly, since poetry, music and humour are all strongly right hemisphere-dependent – and, not incidentally, effective discouragements to dogmatism and self-righteousness – we find that the poetry of metaphor, along with music, dance and laughter are all abjured once fundamentalism rules. The Reformers, and later the Puritans, laid waste to art and sculpture on a tragic scale, disapproved of music in worship, pissed (literally) on the sacred, took metaphorically intended language literally, and wrote tracts against laughter and comedy, which when the Puritans came to rule England in the mid-seventeenth century, they outlawed. Fundamentalist Islam is currently engaged in destroying irreplaceable masterpieces of sculpture and architecture, and is similarly recalcitrant to metaphor, has disapproved of music for centuries,²⁴⁶ and disapproves of laughter.²⁴⁷ (Of course, Islam has its own wonderful history of religious poetry, music and dance in Sufism; the richness of poetry, art, and music in the history of Christianity is equally obvious.) And so it is that what should be a glorious spontaneous expression of humility, gratitude, awe, and vitality, becomes one of Pharisaic vaunting, regulation, right-thinking and fearful discouragement.

This happens whenever fundamentalism raises itself up, because fundamentalism is itself an expression of left hemisphere thinking. It has nothing to do with religion in itself: the triumph of left hemisphere thinking is demonstrable in wholly secular contexts such as, for example, Sovietism,

under which jokes were an imprisonable offence, art (once it had done its necessary work as propaganda) was to be abolished, and all music had to be in service to the state to be accepted. Extreme in its view, black and white in its judgment, angry and self-righteous in its disposition, it seeks control and power, the *raison d'être* of the left hemisphere, not understanding, which is the *raison d'être* of the right. (Not dissimilar fundamentalist mindsets – especially in identity politics – are readily identifiable in our own age and in the West.) Religion of this kind is coercive: so intent on imposing control that it will resort to all sorts of wickedness and cruelty in order to do so.

The Christian religion is unusual for its metaphysically complex creed, which unfortunately leads straight into the territory of the left hemisphere. No other religion seems to expect such a level of assent to what are cast superficially as improbable intellectual propositions. But that is because they have been translated by the left hemisphere-minded out of *mythos* and into *logos*, giving the impression that a religious disposition involves having to believe six impossible things before breakfast. Although as a teenager I therefore tended to dismiss its tenets as incomprehensible and possibly nonsensical, with living I have come to see them as intuitive insights, misrepresented to me as if they were something to evaluate like a chemistry experiment.

Legalism is an unattractive element in all three of the monotheistic religions. I see it as the inevitable reaction of the left hemisphere to an essentially right hemisphere phenomenon, an attempt to make what are necessarily uncertain, but nonetheless profound, insights into the nature of Being, certain and declarative: 'let's codify, make the rules explicit, clarify our terms, rationalise the subtleties out of existence, and make it all *cognitive*.' If you want a lasting institution, that is what you may feel forced to do. Fortunately in Christianity, Judaism and Islam, there is an equally strong belief in the importance of praxis, a rich *mythos* and a profound mystical literature, which counterbalance all this. Learning here is not about facts. 'Probably most worthwhile learning', writes Charles Foster, 'is actually *anamnesis*: unforgetting.'²⁴⁸ In other words, as Plato taught, being brought to a place where we once again recognise what our daily habits of thought have prevented us from seeing and have clouded over.

The need for certainty is a sign of mental imbalance, and nothing is a greater waste of time than debating with someone who doubts everything, on the grounds that only certainty is admissible. Similarly with the need

always to be right. The Germans have a word for such a person, *ein Rechthaber*. Offering, if need be, yet more evidence of hemisphere imbalance, the left hemisphere tendency to black and white views is more common among the technically minded, which is why engineers are over-represented amongst religious fundamentalists and radicals.^{[249](#)}

Czesław Miłosz quotes ‘an old Jew of Galicia’:

When someone is honestly 55% right, that’s very good and there’s no use wrangling. And if someone is 60% right, it’s wonderful, it’s great luck, and let them thank God. But what’s to be said about 75% right? Wise people say it is suspicious. Well, and what about 100% right? Whoever says he is 100% right is a fanatic, a thug, and the worst kind of rascal.^{[250](#)}

The smaller the question, the clearer the answer. Expecting clear answers to big questions is to be thinking too small. Informed opinion and judgment are all each of us has to go on when dealing with any of the big questions about the world. And that’s no bad thing by any means; it’s much more intelligent than thinking everything is a matter of fact. An opinion is always a choice of some part of a whole, concealing some things, as any viewpoint must, as well as revealing others. Being sceptical is not a mindless matter of rejecting as wholly false something that cannot be proved, but which might contain truth; any more than it is to accept something indiscriminately because it is theoretically correct without testing it on the business of living. It is to run a course between uncritical rejection and uncritical acceptance. The word ‘sceptical’ ultimately comes from the Greek word *skopos*, a watchman: the verb *skeptesthai* means to keep a look out, to pay vigilant attention, so as to be in a position to know for yourself.

Indeed, though belief in God is sometimes presented as credulity, and its rejection as scepticism, the reverse is equally true. To some people, believing in the reality of something that cannot be seen or measured is credulity; to others, believing that there is only what can be seen and measured is credulity. Choose your scepticism. As Kierkegaard pointed out, it can come about that the unreasonable sceptic ‘precisely out of fear of being deceived is thereby deceived.’^{[251](#)}

The approach to God requires imagination: but, as you know from Chapter 19, I take imagination to be our only means of approaching reality of any kind, *a fortiori* that of God. It is certainly not a guarantor of truth – there isn't any; but its absence is a guarantor of failure – failure to properly understand truths of any kind, including those of science. Imagination is what enables us to forge the link between our individual experience and something beyond, that is, ultimately, the universal – and by that very process the universal becomes no longer beyond the confines of experience. Imagination is always extending from the dead realm of language into the living world that it alone can bring forth for us. But imagination is proscribed once religion is misunderstood by the left hemisphere.

Militant atheism

I mentioned a second form in which the left hemisphere, assuming mastery, treats the divine. When the unaided left hemisphere comes to confront something which it doesn't understand and cannot imagine how to approach, it turns it into something it could understand – and then either accepts it or rejects it. We have seen accepting it: perverted religion. Now let's look at rejecting it: atheism.

On the closeness of the phenomena Jonathan Rée is acute. Speaking of the militant atheist AC Grayling, 'quite considerably a left-hemispheric creature' by his own description,²⁵² he writes:

Militant atheism makes the strangest bedfellows. Grayling sees himself as a champion of the Enlightenment, but in the old battle over the interpretation of religious texts he is on the side of conservative literalist fundamentalists rather than progressive critical liberals. He believes that the scriptures must be taken at their word, rather than being allowed to flourish as many-layered parables, teeming with quarrels, follies, jokes, reversals and paradoxes. Resistance is, of course, futile. If you suggest that his vaunted 'clarifications' annihilate the poetry of religious experience or the nuance of theological reflection, he will mark you down for obstructive irrationalism. He is, after all, a professional philosopher,

and his training tells him that what cannot be translated into plain words is nothing but sophistry and illusion.

The distinction between believers and unbelievers may be far less important than Grayling and the New Atheists like to think. At any rate it cuts right across the rather interesting difference between the grim absolutists, such as Grayling and the religious fundamentalists, who think that knowledge must involve perfect communion with literal truth, and the sceptical ironists – both believers and unbelievers – who observe with a shrug that we are all liable to get things wrong, and the human intellect has a lot to be modest about. We live our lives in the midst of ambiguities we will never resolve. When we die our heads will still be filled with a few stupid certitudes mixed in with some more or less good ideas, and we are never going to know which are which. There is no certainty, we might say: so stop worrying about it.²⁵³

In his *Atheist Manifesto*, Sam Harris, perhaps like Grayling, shows a similar preference for fundamentalists:

Although it is easy enough for smart people to criticize religious fundamentalism, something called ‘religious moderation’ still enjoys immense prestige in our society, even in the ivory tower. This is ironic, as fundamentalists tend to make a more principled use of their brains than ‘moderates’ do.²⁵⁴

Atheism and religious fundamentalism have a common quality that would be puzzling if we could not see that both stem from the same place in that brain. ‘Religious beliefs’, continues Harris, ‘to be beliefs about the way the world is, must be as evidentiary in spirit as any other. For all their sins against reason, religious fundamentalists understand this; moderates – almost by definition – do not.’²⁵⁵ What counts as ‘evidentiary’ is not discussed. Neither is the word ‘principled’: which principles? Those of the left hemisphere only, of course. Why? Because they are *obviously* right. I am reminded of the limpet stuck to the rock of the obvious: ‘Atheism is not a philosophy; it is not even a view of the world; it is simply a refusal to deny the obvious.’²⁵⁶ The thought crosses one’s mind that more philosophy

might help here. ‘A little philosophy inclineth man’s mind to atheism’, wrote Bacon already in 1597; ‘but depth in philosophy bringeth men’s minds about to religion.’²⁵⁷

The significant divide is, as usual, not based on the ‘what’, but the ‘how’: not between atheism and belief at all, but between those who approach the world literally and dogmatically, and those who approach the world with a richer understanding of metaphor and a capacity to tolerate uncertainty, be they agnostics or believers in a divine cosmos.

To the left hemisphere’s mindset many things must seem obvious. Among them would be: that anything true can be expressed in everyday language; that all truths must agree with one another; that paradox is a sign of sloppy thinking; that what is not precise or certain just requires more thought to become precise or certain; that metaphor is a tool of obfuscation; that it makes no sense that not-knowing can sometimes lead one closer to truth than knowing, not-naming lead closer than naming; that everything can be understood if it can just be reduced systematically to its parts; that context can’t alter the nature of an entity, which is something it has in *itself*; that dealing with the representation of something is just as good as dealing with its presence, except quicker and more efficient; that the living is in reality just mechanical; that believing in a God is, to quote Bertrand Russell, like believing ‘that between the Earth and Mars there is a china teapot revolving about the sun’.²⁵⁸ And so such people are not going to be able to get to first base when it comes to approaching the divine. Nor, if it comes to that, with physics – or with almost any academic discipline, with the exception of Anglo-American analytic philosophy.

What is encountered spiritually can be conveyed best by poetry, drama, ritual, image, narrative, music – by means, in other words, that are implicit, embodied, and contextually rich. They are resonant rather than declarative. The inherent weakness of the analytic method applied to theological matters has been aptly described as ‘cognitive *hemianopia*’.²⁵⁹ This suggests that only half the visual field, and therefore one hemisphere’s view, is being taken into account.

As William James noted more than a century ago, ‘the more fervent opponents of Christian doctrine have often enough shown a temper which, psychologically considered, is indistinguishable from religious zeal’.²⁶⁰ Militant atheism is marked by the same left hemisphere characteristics of intolerance, self-righteousness and a refusal to accept that all positions,

without exception, make assumptions that are open to question. It has, too, its own rituals, its denunciations, and its sacred texts. ‘The Brights’, as a group of them like to call themselves, sound uncomfortably like the Chosen Few. ²⁶¹

George Steiner, in his Massey Lectures, observed that ‘the political and philosophic history of the West during the past 150 years can be understood as a series of attempts – more or less conscious, more or less systematic, more or less violent – to fill the central emptiness left by the erosion of theology.’²⁶² Central emptiness is a vacuum, and nature abhors it: something else will find its way to occupying the space formerly occupied by God, but we can’t do away with the space itself. Steiner noted that these attempts are characterised by familiar claims to be able to explain everything, by canonic texts delivered by a founding genius, and by a zealous orthodoxy, amongst other things. He calls these attempts ‘a kind of *substitute theology*’:

They are systems of belief and argument which may be savagely anti-religious, which may postulate a world without God and may deny an afterlife, but whose structure, whose aspirations, whose claims on the believer, are profoundly religious in strategy and in effect ... we will recognise in them not only negations of traditional religion (because each of them is saying to us, look, we don’t need the old church any more – away with dogma, away with theology), but systems which at every decisive point show the marks of a theological past ... [and] are very much like the churches, like the theology, they want to replace.²⁶³

One of the myths of atheists is that science and religion are incompatible. Belief in God cannot be in conflict with science, because such belief is not part of a competition between differing reasons or explanations. God is rather seen as the ground of there being such things as reasons or explanations at all. But that is not something of which the natural *modus operandi* of the left hemisphere can make sense, so one should expect confusion here.

In an earlier chapter I quoted Einstein to the effect that when it comes down to one’s grounding assumptions in physics ‘there leads no logical

path, but only intuition, supported by being sympathetically in touch with experience.’ I commented that this is a beautiful expression of the purest Pragmatism. It might be noted that the approach to truth that I find most compelling, that of the Pragmatists, underlies not only the best way to deal with the everyday world, but both the best science and the best sacred traditions, much as practitioners in either of these fields might not welcome the insight into their relationship.

There is, put simply, more to religion than science can possibly prove or disprove.²⁶⁴ For this reason none other than the atheist’s ally ‘Darwin’s bulldog’, TH Huxley, wrote

of all the senseless babble I have ever had occasion to read, the demonstrations of these philosophers who undertake to tell us all about the nature of God would be the worst, if they were not surpassed by the still greater absurdities of the philosophers who try to prove that there is no God. ²⁶⁵

Huxley would have had little time, then, for Jerry Coyne’s *Faith vs. Fact: Why Science and Religion Are Incompatible*, a book notable not just for its ‘no holds barred’ title, but because it has prestige among the New Atheists and may be considered representative of their thinking.²⁶⁶

On the first page of his book Coyne declares that ‘science and religion ... are *competitors* at discovering truths about nature’ (my emphasis), which is hardly promising, since religions are not explanatory theories about the world but, in Wittgenstein’s phrase, ‘forms of life’.²⁶⁷ To call them competitors at the very outset is to assume the conclusion you were supposed to be arguing towards, commonly known as begging the question. For him a religious text such as the Bible can be read only literally and he is simply uncomprehending of those who suggest it might be read otherwise. He writes:

One of the most common arguments against such literalism is this: ‘The Bible is not a textbook of science’. When I see that phrase, I automatically translate it as, ‘The Bible is not entirely true’, for that is what it means.²⁶⁸

Since, according to Bohr, ‘when it comes to atoms, language can be used only as in poetry’, it may be that Coyne not only misunderstands the nature of religion, but misunderstands the nature of the ‘textbook of science’.²⁶⁹

The literalism of the fundamentalist Christian is paralleled by the literalism of the fundamentalist atheist; and here Coyne is a beautiful example. Coyne assumes that there cannot be (at least superficially) incompatible truths. Throughout this book I have emphasised that there are often ‘incompatible’ truths, and that the intelligent thing to do is not to force an ‘either/or’ (the left hemisphere’s only gambit) but accept a ‘both/and’ (as the right hemisphere understands), since, importantly, they may be truths on different levels, truths of different kinds, or, since all truths can be partial only, may both be needed to see a fuller picture. And that leads to the question what we mean by true. For some that will be, naturally, ‘obvious’, but they might be better not to advertise the fact.

‘In this book’, Coyne writes early on in *Faith vs Fact*, ‘I will avoid the murky waters of epistemology by simply using the words “truth” and “fact” interchangeably’.²⁷⁰ But if one is really going to avoid the murky waters of epistemology to that extent, might it not have been better to save oneself the trouble of writing the book?²⁷¹ As readers will know, such an equation simply renders the exercise worthless, since absolutely central to all debate in this area are such epistemological questions as: what does it mean to know, and how do we come to know anything? The answers are not obvious. As you can imagine, then, Coyne is impatient of theologians and philosophers who think there is more to discuss here; their fine distinctions and desire to deal with things in a manner not wholly cut and dried are interpreted by him as merely the wriggling of those who want to escape the rigour of his shiny new logic.

‘My claim is this’, Coyne might well have written: ‘science and the arts are incompatible because they have different methods for getting knowledge about reality, have different ways of assessing the reliability of that knowledge, and, in the end, arrive at conflicting conclusions about the universe.’ But actually that’s not what he wrote. He wrote the very same words, except that where I have ‘the arts’, he had ‘religion’.²⁷² However, if the structure of the argument is correct, it must follow that science and the arts are also incompatible, and that we had better be campaigning to do away with one of them.

Why should we consider literal truth superior to, rather than just different from, metaphoric truth? We need both and they have different proper applications. They are not in conflict. It may be that, ultimately, literal truth is merely a special case, the limit case, of metaphorical truth, as actuality is a special case, the limit case, of potentiality; and that making the difference into a dichotomy is a product of modern Western ways of thinking. *Mythos* was considered anciently truer than *logos*, and not by simple people either, but by sophisticated people who had a different outlook on the world. According to Christianity, God is not separable from the creation and is *in* the tangible world, not just spectating from outside; since the Christian mythos concerns divine instantiation in the world, it would seem fitting that this was an instantiation in every possible meaning of the term – literal as well as metaphorical. Since we don't know much, this is not something we can dogmatise about. I certainly don't know. I feel like echoing Bohr here: 'I wish Einstein would stop telling God what he can and can't do with his dice'. Faith, like true science, is not static and certain, but a process of exploration that always has in sight enough of what it seeks to keep the seeker journeying onward.

Sir Francis Bacon wrote that 'they are ill discoverers that think there is no land when they can see nothing but sea.'²⁷³ To which I would add, they are ill discoverers that think the land they are set out to seek will be like the land they have left behind.

In a different world, one where such things are more certain, Coyne knows already that dialogue with theists is a waste of time. 'Anything useful', he writes, 'will come from a monologue – one in which science does all the talking and religion the listening. Further, the monologue will be constructive for only the listener.'²⁷⁴ The image is of the religious person as the naughty child, corrected by the prissy headmistress. I can't immediately bring to mind a better expression of the left hemisphere's arrogance: nothing outside its hall of mirrors could possibly have any merit. Anyone trying to see whether there is anything beyond it needs to be hauled back in to be re-educated: there is nothing beyond what it knows.

But, in circumstances such as these, instead of saying 'I'll do the talking round here', it might prove a better plan to enter into a tentative conversation with those who see what it is you don't. It's a well-tried path; and it means you stand a chance of gaining insight into something about which you pride yourself on knowing nothing.

Here is Popper warning science – not religion – of the danger he saw:

I am on the side of science and of rationality, but I am against those exaggerated claims for science that have sometimes been, rightly, denounced as ‘scientism’. I am on the side of *the search for truth*, of intellectual daring in the search for truth; but I am against intellectual arrogance, and especially against the misconceived claim that we have the truth in our pockets, or that we can approach certainty.²⁷⁵

And here is the astrophysicist Carl Sagan, an atheist, on the importance of accepting differing kinds of intelligence and knowing:

If we know only one kind of life, we are extremely limited in our understanding even of that kind of life. If we know only one kind of intelligence, we are extremely limited in knowing even that kind of intelligence ... broadening our perspective, even if we do not find what we are looking for, gives us a framework in which to understand ourselves far better. I think if we ever reach the point where we think we thoroughly understand who we are and where we came from, we will have failed. I think this search does not lead to a complacent satisfaction that we know the answer, not an arrogant sense that the answer is before us, and we need to do only one more experiment to find out.²⁷⁶

Understanding that there are different kinds of knowing – without which a project such as Coyne’s book is a massive exercise in missing the point – is not in itself a matter of religious belief at all. It is rather the outcome of having reflected a little on experience and of having reached some degree of insight into what it is we can say we know. Thinking you know prevents you knowing, since knowing is always a process, not a state, and one that never ends. ‘One can only become a philosopher’, wrote Friedrich Schlegel, ‘not be one. As soon as one thinks one is a philosopher, one stops becoming one.’²⁷⁷

All in all, the history of the supposed ‘conflict’ between science and religion makes fascinating reading.²⁷⁸ But it has done great harm to clear

thinking. It has entrenched a false antithesis: an entirely material view of the world as the only alternative to ‘superstition’. This has done immeasurable harm. According to Hart,

the materialist metaphysics that emerged from the mechanical philosophy has endured and prevailed not because it is a necessary support of scientific research, or because the sciences somehow corroborate its tenets, but simply because it determines in advance which problems of interpretation we can all safely avoid confronting.^{[279](#)}

In other words, it narrows the field to those questions that such a mechanistic ‘philosophy’ is equipped to answer. But, if we are astute, we should try to be aware of what is being excluded from the conversation – that of which we are otherwise unaware that we are unaware – and why. Modern physics has forced much on our attention that was formerly, mistakenly, disregarded by mechanists.

On the matter of God, the evolutionary biologist Stephen Jay Gould put it rather clearly:

To say it for all my colleagues and for the umpteenth millionth time (from college bull sessions to learned treatises): science simply cannot adjudicate the issue of God’s possible superintendence of nature. We neither affirm nor deny it; we simply can’t comment on it as scientists.^{[280](#)}

One can sense his frustration: why did it have to be said umpteen millions of times? Because scientism has all the qualities of the worst kind of religion (with luck, this remark will confirm itself by being appropriately anathematised). Things over which science has no jurisdiction are a threat, not to real scientists, only to adherents of scientism, whose motive is power.^{[281](#)} Scientism, according to Roger Scruton, is ‘a bid to reassemble the complex matter of human life, at the magician’s command, in a shape over which he can exert control. It is an attempt to *subdue* what it does not understand’.^{[282](#)} Good scientists should be doing their utmost to distance themselves from the sorcerer’s apprentices of this world. Scientism

damagingly makes science appear craven, foolish, power-hungry. That is a terrible sleight on something – science – which we haven't learnt how to value properly.

In a famous speech celebrating the legacy of Darwin, Karl Popper had this to say:

It is important to realize that science does not make assertions about ultimate questions – about the riddles of existence, or about man's task in this world. This has often been well understood. But some great scientists, and many lesser ones, have misunderstood the situation. The fact that science cannot make any pronouncement about ethical principles has been misinterpreted as indicating that there are no such principles.²⁸³

Science can't pronounce on moral principles, and it can't answer the question of God's existence one way or the other. That doesn't mean there is a *conflict* here between science and God: that would only be possible if, on the contrary, it *could* answer the question. Peter Medawar, whom Richard Dawkins himself described as 'a giant among scientists',²⁸⁴ unequivocally affirmed 'the existence of questions that science cannot answer, and that no conceivable advance of science would empower it to answer'.²⁸⁵ Top of that list has to be, *pace* Dawkins and Coyne, the existence of God: to think otherwise is to commit a category mistake.

Many of the greatest scientists, of course, would have been horrified that the New Atheists should claim science rendered religion, effectively, hogwash. That so many scientists, past and present, have succeeded in combining the practice of science with religion is relevant to Coyne's assertion that they are incompatible. Instead of taking a hint from this, Coyne brushes it aside as evidence of the human tendency to be inconsistent. But that won't quite do: many scientists, including the very greatest of scientists, undeniably go out of their way to talk of their religious beliefs and their scientific beliefs in the same breath, and even in terms of one another. (I have included some examples, drawn from the greatest among scientists, in Appendix 8.) According to a book-length study of the beliefs and characteristics of Nobel Laureates,²⁸⁶ overall only 10.5% described themselves as 'atheist, agnostic, freethinker or otherwise

nonreligious at some point in their lives'. What is striking, however, is that while the figure reaches as high as 35% for Laureates in literature, the figures for science are 8.9% in physiology/medicine, 7.1% in chemistry, and 4.7% in physics. Since Nobel prizes are a twentieth-century invention, that means that, as far as we know, 95.3% of the most acclaimed physicists of the twentieth and twenty-first centuries were consistent theists – still more striking when one realises that agnostics and 'freethinkers' counted, for the purposes of this exercise, as non-believers.

A very one-sided, not to say downright inaccurate, account of the role played by religious institutions in the development of science has gone unchallenged into pop culture. Yet undoubtedly a vast body of scientific research and development occurred under the aegis of the Church, which both supported and encouraged it. The account has been not just one-sided, but subject in some instances to deliberate misdirection. For example, do you believe that people thought the world was flat until Columbus's voyage? Or that Copernicus 'dethroned' the world by demonstrating that it was not at the centre of the universe? You may be surprised to learn that these are nineteenth-century inventions (see Appendix 8 for further details).

Before leaving the New Atheists, it's worth noting another aspect of their outlook that is highly characteristic of the left hemisphere when it assumes the role of master: anger. We saw this tendency of the left hemisphere in Chapter 6. Here it manifests itself in their attitude to anyone who has the effrontery not to share their views. A representative example is Richard Dawkins, who once described religion on Twitter as 'an organised licence to be acceptably stupid'. In a subsequent moment of illumination he tweeted: 'How dare you force your dopey unsubstantiated superstitions on innocent children too young to resist? How DARE you?'²⁸⁷ Of course, if he is referring to the sort of dogmatic, fundamentalist religion conjured up by the left-hemisphere-as-master and discussed in the previous section, then I can see his point; though I have no particular interest in intervening in a civil war within Lucifer's camp. But his anger seems directed more widely. He seems to believe that unless 'forced' to think differently, children (and, one imagines, people in general) would naturally incline to the atheist position that Dawkins champions. He seems to take it as read that this is the human default position: hence 'how DARE you?'

Fortunately some necessary intellectual content can be added to this 'debate' by research on children's spirituality, and human spirituality in

general. Evidence on this and a number of other matters, such as the relationship between religious belief and health, is also to be found in Appendix 8. In summary, it demonstrates that children naturally express themselves in spiritual terms, irrespective of their upbringing; and that religious belief in general is shaped by, but not originated by, culture. The research raises a number of questions. If religious beliefs arose evolutionarily to enable us to account for what we cannot explain, why are they invoked in some types of cases only, and our ignorance accepted in others? If, on the other hand, religion is a product of cultural indoctrination, why does it surface in the face of the strongest cultural discouragement (for example, in an atheist totalitarian state)? One answer might be that we have a religious sense because there is something there in the world (as with all the other senses) in response to which the appropriate ‘perceptive organ’ arose. There are, of course, other answers that don’t involve such a conclusion, but they don’t have the field to themselves, from a purely rational point of view.

The research shows that experiences of the divine are far from uncommon, and when they do occur, often do so in formerly non-believing subjects; have a benign and sometimes life-transforming impact; and are quite unlike hallucinations and delusions in quality, effect, and subsequent evaluation by the individuals who experienced them. While it has been argued that theism is a product of mental style and culture, it is just as arguable that atheism is a combination of personality type, mental style and culture – one that promotes atheism as smart and religion as naïve. And given the commonalities between right hemisphere deficit conditions and autistic spectrum disorders, it is relevant that autism-spectrum disorders make belief in God less likely (in a series of four studies, neurotypical (viz, ‘normal’) subjects were 10 times as likely as those on the spectrum strongly to endorse the idea of God).^{[288](#)}

The evidence is also that religious belief has a dramatic positive impact on both psychological and physical health, certainly comparable with, if not superior to, most ‘lifestyle’ changes known to modern medicine to have a beneficial effect; and is associated with prosocial behaviour (Appendix 8).

Sam Harris writes that the ‘honest doubts of science are better – and more noble – than the false certainties of religion.’^{[289](#)} But this is a false antithesis. Honest doubts are by definition better than false certainties; and though the imputation is that religion is falsely certain and science honest in

its doubt, it is easy to find examples of the precise reverse. Only the worst of religion is falsely certain, and only the best of science is honest in its doubt. I can think of certain dogmas of materialist science, just as I can of religious dogmas, that are false certainties that impede its access to truth; the oppressive intolerance for ideas that do not conform to the narrow orthodoxies of modern biology is so well documented that the idea that nobility, honesty and self-questioning characterise science alone is laughable. Equally the genuinely exploratory process involved in an openness to the idea of God raises as many questions as it answers, just as does the genuinely exploratory process of a truly open science.

Problems began only when science started to categorise whole swathes of experience as inadmissible evidence. This began relatively recently, not earlier than the mid-nineteenth century. What can be measured was alone henceforth real. This is obviously untrue: love, merely to take one example, is both real and unmeasurable. ‘Anyone who claims, “if it can’t be measured, if it can’t be quantified, it isn’t real” is not without religion’, writes Richard Muller, professor of physics at Berkeley.²⁹⁰ The demand is a typical left hemisphere misunderstanding. What is more, it is demonstrably founded in neither science nor reason. ‘The atheist’s essential case that the only truths that we should accept are those for which there is an empirical or scientific basis’, writes Jonathan Gaisman, ‘does not itself have an empirical or scientific basis. The notion that the only things worthy of belief are those which are objectively verifiable is not itself an objectively verifiable belief.’²⁹¹

Invoking God draws attention to the intrinsic limits of knowing; invoking science tends to result in the opposite – to a belief that all will one day be known, that there are only problems to be solved, and ones for which we are getting ever nearer the solution: ‘the answer is before us’. It would be easy to reply that science, too, is a process, and in one sense that is obviously true. But that would be to fail to grasp a difference. Science is, in Carse’s terms, a finite game; philosophy and religion are infinite games. Science is convergent on a target, that becomes – theoretically, if not in practice – more certain as it is approached, and the point of the process lies in achieving that target; yet philosophy and religion are divergent, as the nature of the target becomes less certain as it is approached, and the point of the process lies in itself. For science knowledge is things; for philosophy

and religion knowledge is a process of understanding *what these things mean*.

So should we conclude that science and religion are separate, but nonetheless compatible, modes of understanding the world? Gould famously thought they were: he called them ‘non-overlapping magisteria’.²⁹² This might seem in contrast to Julian Huxley’s saying that ‘it is no longer possible to maintain that science and religion must operate in thought-tight compartments ... The religiously-minded can no longer turn their backs upon the natural world ... nor can the materialistically-minded deny importance to spiritual experience and religious feeling.’²⁹³ But it is not. Huxley, like Gould, did not deny the validity, on its own terms, of either form of understanding: what he emphasised was that each should take into account the other – a quite different matter. Both Gould and Huxley’s thoughts on the topic have, however, been widely ignored. This is a calamity.

Just as naïve materialists do great damage to science by their over-reaching claims of access to ‘the truth’ – even to sole access to truth – on her behalf, so do misguided religious figureheads and their lay ‘supporters’ to religion, when they don’t know enough to see what it is they don’t know. Freed from such damaging accretions, however, science and religion have much in common: both being projects that, when carried out in a spirit of humility, are potentially beautiful and good. They are both, at their best, an honest, dignified reaching after truth, of different kinds, though never finally in possession of it. They should be able to honour one another, and work together towards the common goal of understanding the world better. If they can’t, something has gone badly wrong.

Science has its own assumptions and beliefs – that’s not a criticism, it could not be otherwise. It is an approach to the world we very much need. The question is just whether it is the *only* one we need. After all, why should it be? ‘What we see of the world’, writes physicist Marcelo Gleiser,

is only a sliver of what’s ‘out there’ ... Like our senses, every instrument has a range. Because much of Nature remains hidden from us, our view of the world is based only on the fraction of reality that we can measure and analyse. Science, as our narrative describing what we see and what we conjecture exists in the natural world, is thus necessarily limited, telling only part of the story ...

We strive toward knowledge, always more knowledge, but must understand that we are, and will remain, surrounded by mystery.’²⁹⁴

A secular construction of the human world in the West, with little or no place in it for the spiritual, has become the default view among the deracinated, intellectual classes, who prioritise autonomy over most other values. As Peter Berger explains:

There exists an international subculture composed of people with Western-type higher education ... that is indeed secularised beyond measure. This subculture is the principal ‘carrier’ of progressive, Enlightenment beliefs and values. While its members are relatively thin on the ground, they are very influential, as they control the institutions that provide the ‘official’ definitions of reality, notably the educational system, the media of mass communication, and the higher reaches of the legal system ... I can only point out that what we have here is a globalised *élite* culture.²⁹⁵

A proper scepticism, it should be remembered, applies not just to discerning the limits of intuitions, as it almost always seems to do nowadays, but to discerning the limits of analysis, as it rarely, if ever, does any more. ‘Over the last century’, writes Hart,

Anglo-American philosophy has for the most part adopted and refined the methods of ‘analytic’ reasoning, often guided by the assumption that this is a form of thinking more easily purged of unexamined inherited presuppositions than is the ‘continental’ tradition. This is an illusion. Analytic method is dependent upon a number of tacit assumptions that cannot be verified in their turn by analysis: regarding the relation between language and reality, or the relation between language and thought, or the relation between thought and reality’s disclosure of itself, or the nature of probability and possibility, or the sorts of claims that can be certified as ‘meaningful’, and so on. In the end, analytic philosophy is no purer and no more rigorous than any other style of philosophizing. At times, in fact, it functions as an excellent vehicle for avoiding

thinking intelligently at all; and certainly no philosophical method is more apt to hide its own most arbitrary metaphysical dogmas, most egregious crudities, and most obvious flaws from itself, and no other is so likely to mistake a descent into oversimplification for an advance in clarity. As always, the rules determine the game and the game determines the rules.²⁹⁶

Trying to understand religion purely analytically is hardly more likely to be effective than trying to understand Schubert by doing a statistical breakdown of the frequency of particular notes, their lengths, and so on. One really might as well rewire the amplifier into a food processor.

‘Though religion will live on in the minds of the unlettered, in educated circles faith is entering its death throes’, writes Richard Dawkins. ‘Symptomatic of its terminal desperation are the “apophatic” pretensions of “sophisticated theologians”, for whose empty obscurantism Coyne reserves his most devastating sallies.’²⁹⁷ Dawkins is clearly more easily impressed than I was: Coyne’s sallies, like many of his own, seemed to me, if I am honest, somewhat less than devastating, and to show that he had not fully understood what he was talking about. And Dawkins must surely know better than to call the apophatic path a symptom of what he calls ‘terminal desperation’. Its Christian origins lie in the second century AD, and it has been an important tradition throughout a period of nearly two thousand years in the West in which religion was in no way defensively embattled against atheists. It is recognised as a path to wisdom in every major tradition of both East and West – in Buddhism (Zen is the world’s greatest expression of it), Hinduism, Judaism, and Islam as well as Christianity, for millennia – and has nothing to do with ‘pretensions’ of any kind. Nor is it aimed to deflect his kind of cavils, whatever he might like to imagine. Indeed Meister Eckhart, a representative of the tradition in the thirteenth century, risked everything to express himself in this way, and has the distinction of being the only mediaeval theologian to be tried for heresy: it was feared by the Dominican authorities that what he said could ‘easily lead simple and uneducated people into error’.²⁹⁸ Given that, on this evidence, even those in ‘educated circles’ can no longer begin to understand what Eckhart was talking about, it looks to me as though they might have had a point.

There is of course more to say, some of which is to be found in Appendix 8.

WHY IT MATTERS

Perspective alters what we see. The left hemisphere is rigid, but we need to think flexibly, so as not to get trapped into one world view and imagine it is everything. According to Suzuki:

In Japanese, we call someone who understands things from just one side a *tamban-kan*, ‘someone who carries a board on his shoulder’. Because you carry a big board on your shoulder, you cannot see the other side. You think you are just an ordinary human, but if you take the board off, you will understand, ‘Oh, I am Buddha, too. How can I be both Buddha and an ordinary human? It is amazing!’ That is enlightenment. ²⁹⁹

There is something much too small about a world in which we are isolated from the divine; in a ‘disenchanted’ world, as it has been called, one that has no place for the sacred, we ourselves loom, imaginatively, far too large, as if, occupying too much of the screen. At the same time we see ourselves conceptually as diminished, because as soon as we pan out, we see ourselves dwindle to a pointless speck in a barren cosmos. A religious cast of mind sets the human being and human life in the widest context, reminding us of our duties to one another, and to the natural world that is our home; duties, however, that are founded in love, and link us to the whole of existence. The world becomes ensouled. And we have a place in it once more.

Max Scheler called man the *ens amans*, the being whose defining feature it is, that it is capable of love. (I’d say that we are not alone in this, but the point stands.) If there were not already enough reasons to reject the eighteenth-century image of ‘man the machine’, this is another. No machine is capable of love. Yet, love is creative and curative: as we have seen, according to traditional Judaic teaching, *tikkun*, repair, is brought about by human acts of compassion in the world, much as the redemption which Christ symbolises is realised and renewed in the acts of kindness and mercy of each one of his followers. There are sparks of divine fire still burning in the fragments of the vessels out of which we rebuild the world.

I keep coming back to Blake's amazing line, 'Eternity is in love with the productions of time.'³⁰⁰ And, you can be sure of it, what Blake meant was nothing cosy. He was the least cosy of poets, and one of the most insightful, that ever lived. This love he speaks of is not merely some tasty, nutritious and comforting *olla podrida*. It certainly does add flavour and substance to life, and at times is a great comfort; but it is, as it is the nature of love to be, spiritually demanding, capable of shaking you to the core: the *mysterium tremendum et fascinans*.³⁰¹ According to the great philologist Max Müller,

Soul is the Gothic *saivala*, and this is clearly related to another Gothic word, *saivs*, which means the sea. The sea was called *saivs* from a root *si* or *siv*, the Greek *seio*, to shake; it meant the tossed-about water, in contradistinction to stagnant or running water. The soul being called *saivala*, we see that it was originally conceived by the Teutonic nations as a sea within, heaving up and down with every breath, and reflecting heaven and earth on the mirror of the deep.³⁰²

Evelyn Underhill pointed out that the mystics 'all knew, as Richard of [St] Victor said, that the Fire of Love *burns*.'³⁰³ We have not fulfilled our destiny when we have sat down at a safe distance from it, purring, like overfed cats.'³⁰⁴ We need what the Czech phenomenological philosopher and human rights activist Jan Patočka called 'shakeness', so as to be fundamentally open to transcendence, to the radical astonishment of Being. Not to be astonished is not to be truly alive. It is something of which we have intimations, intimations that fill us with a healthful fear and awe; fear in the sense of reverence, not timidity. So CS Lewis said:

I do not see how the 'fear' of God could have ever meant to me anything but the lowest prudential efforts to be safe, if I had never seen certain ominous ravines and unapproachable crags. And if nature had never awakened certain longings in me, huge areas of what I can now mean by the 'love' of God would never, so far as I can see, have existed.³⁰⁵

Yet in Eckhart's words, 'God is nearer to me than I am to my own self.'³⁰⁶ God situates us firmly in the cosmos. Where we have been taught to see human consciousness as 'an anomalous tenant of an alien universe', that consciousness is reframed as 'the most concentrated and luminous expression of nature's deepest essence.'³⁰⁷ Alan Watts puts the matter well:

This feeling of being lonely and very temporary visitors in the universe is in flat contradiction to everything known about man (and all other living organisms) in the sciences. We do not 'come into' this world; we come *out* of it, as leaves from a tree. As the ocean 'waves', the universe 'peoples'. Every individual is an expression of the whole realm of nature, a unique action of the total universe.³⁰⁸

Religion takes seriously both the thisness of the individual, at one extreme of the scale, and the fate of the cosmos at the other, and shows them to be part of one whole. It is the absence of this integrative perspective that Dewey called the 'deepest problem of modern life'.

This book has had a consistent message: that the right hemisphere is a more reliable guide to reality than the left hemisphere. In Part I, we saw that it has a greater range of attention; greater acuity of perception; makes more reliable judgments; and contributes more to both emotional and cognitive intelligence than the left. In Part II, we saw that the right hemisphere is responsible for, in every case, the more important part of our ability to come to an understanding of the world, whether that be via intuition and imagination, or, no less, via science and reason. In Part III, I have suggested that the right hemisphere's capacity to deal with what we call 'paradox' is greater; that its understanding of space, motion, and time is deeper and more resonant with the findings of contemporary physics (and all philosophy other than the purely Anglo-American analytic tradition, itself a left hemisphere venture); and that it contributes more to important aspects of consciousness, including the appreciation of values such as goodness, beauty, and truth. So the least strong claim one might make is that the spiritual and divine will be misapprehended if one brings to bear on them only the process for which the left hemisphere is best equipped – analysis to parts, following of procedures, and the presentation of results in language: a process that prioritises the known, the certain, the fixed, the partial, the

explicit, the abstract, the general, the quantifiable, the inanimate and whatever is 're-presented', over the unknown, the uncertain, the flowing, the living and the implicit, the whole, the contextual, and whatever is of unique quality; and all that 'presences' to us, before it has been represented through rationalisations in language. A stronger claim is that, not just here, but in general, we should prefer, wherever possible, an approach that can be identified with the habits of mind of the right hemisphere – a claim which I think, on the evidence I have presented, entirely justified.

One way of thinking about religion is that it instantiates the 'form of life', to return to Wittgenstein's term, of the right hemisphere. In another era there was no way of knowing that that's what it was, of course, but it took the form of a deep intuition about the division of the human spirit, one which has a very long history. The reason that so much time, expense and skilled artistry was devoted to religion, from the most ancient, prehistoric epochs, when lives were shorter and resources scarcer, arose from the understanding that what we now know to be the 'form of life' of the left hemisphere, though obvious and easily expressible, belongs to the banality of everyday, and is far less important than the realm of what is comparatively hidden, but in which everything that matters to us and that gives meaning to life resides. If we should forget that, we would have forgotten how to be fully human. Without such instantiation in the fabric of a culture, it might easily be forgotten: that, then, was the role of religion.

And now it seems we *have* forgotten. In the absence of a tradition that embodies the values that the left hemisphere can't see, we arrive at conclusions about ethical and metaphysical matters of the greatest significance in a manner that might result from putting everything we cared about in the hands of a mediocre bureaucracy, or having to bring it before a law court in a degenerate regime where the art of legal judgment had given way to the slavish following of numbered statutes – or running it through a computer. Meanwhile the very stuff of life ebbs away.

The *raison d'être* of the left hemisphere is control and calculation. Importantly we are not exempt from being the objects of control and calculation in a culture in which all is controlled and calculated. We have the illusion of being in control, whereas there is in truth very little we can control; rather we are controlled, in what Adorno called *die verwaltete Welt*, the 'administered world', one where a new form of total control has taken root in the form of administration – a self-legitimising bureaucracy.³⁰⁹ It is

not that bureaucrats are our new slave-masters; for they are themselves as much enslaved by their bureaucracy as the rest of us. They are, like us, in the grip of the disenchanting drive to control. As Tillich says, we become tools, but when asked for what purpose, there is no reply.

This drive is bigger than us, and it is driving us towards destruction. Thus historian of ideas Paul Bishop says, in a fascinating article on which I here draw, that disenchantment is ‘a consequence and the effect of *being controlled by others*’.³¹⁰ Referring to a radio discussion between Adorno, Horkheimer and Kogon in September 1959, he writes:

In this broadcast Adorno argues that, as the Austrian writer Ferdinand Kürnberger put it, ‘life no longer lives’ (*das Leben lebt nicht*). ‘There is’, Adorno maintains, ‘no longer any life in the sense in which we all use the word life’, because there has been ‘a transition of the entire world, of life as a whole, to a system of administration, to a particular kind of control from above’. In particular, he emphasizes that, in its most recent forms, bureaucracy serves ‘to rationalize the irrational’, whilst the system of planning conceals a complete lack of real planning.

Only the human soul is left to resist this process, being, unlike cognition, beyond ‘administrative control’; it is that part of us that intuits the divine, is in touch with unconscious knowledge and wisdom, and resists the banality of the desacralised, if not actually desecrated, world. As such it is a threat to the administered world, which responds with an otherwise inexplicable wish to crush and exterminate it. Everything that is not explicit, and therefore not reducible to material terms that can be predicted and administered, is to be done away with, as in Freud’s declaration ‘where id was, there shall ego be’. For Jung, on the other hand, ‘the unconscious is the residue of *unconquered* nature in us, just as it is also the matrix of our unborn future’.³¹¹

According to French philosopher Bertrand Vergely, ‘our world is not merely disenchanted, it is in the grip of a malaise’, one that is linked to our incapacity for wonder.³¹² We are *curious* about things, until we know enough to control them; but that is not the same as wonder at all – rather its opposite. We do not permit ourselves to be awestruck or amazed by what it

is we come to see. Dennis Quinn writes: ‘Among those defective in wonder are the inveterately curious’.³¹³ There is, of course, good in curiosity, especially in the young, but it confines one to the smaller questions: no-one, as he points out, says ‘I am curious to know the nature of God’, or ‘I am curious about the meaning of life’. And in reality the lust here is appropriative, to know for myself, so as to have a better *grasp*; whereas in wonder there is an acknowledgment of what must forever lie beyond our grasp, an insight that comes with experience. The curious materialist, by contrast, assumes that, theoretically at least, everything can be definitively known: there are no things in heaven or earth that are not knowable in his philosophy.

Awe and wonder involve an encounter, and are other-directed emotions, in which the ego takes a back seat. On the relationship between this and the seeking after knowledge of all kinds, not least in science, the philosopher Mary Midgley wrote with great insight:

Wonder involves love. It is an essential element in wonder that we recognize what we see as something we did not make, cannot fully understand, and acknowledge as containing something greater than ourselves. This is not only true if our subject-matter is the stars; it is notoriously just as true if it is rocks or nematode worms ... Knowledge here is not just power; it is a loving union, and what is loved *cannot just be the information gained*; it has to be the real thing which that information tells us about ... First comes the initial gazing, the vision which conveys the point of the whole. This vision is in no way just a means to practical involvement, but itself an essential aspect of the whole. On it the seeker’s spirit feeds, and without it that spirit would starve.³¹⁴

In an itself wonderful lecture entitled ‘The work of wonder’, Patrick Curry reminds us that ‘wonder, like the relationships it consists of, is wild; so the correct attitude to it is therefore unpossessive, respectful and indeed reverent. It follows that anything that is being mastered and managed must be something else’:

Wonder, enchantment, astonishment, delight, joy – these are experiences that are not, and cannot be, simply willed into existence or manufactured on demand. They are not under our control, not something we do but something that happens to us (or doesn't). Indeed, trying to use them, to do something purposeful with them, destroys them. Their only use inheres in their use-lessness; their point is precisely in their point-lessness. They can only do their work, whatever that is, if we don't try to put them to work. So whatever else wonder may be, it is not itself instrumental but sufficient unto itself ... It cannot be tested, evaluated, improved, rolled out or developed, and there can be no system or method (let alone methodology) to achieve it – even if the goal is re-enchantment! In fact, that attempt would not only be arrogant but insidious, since it would require tacitly replacing wonder with a biddable simulacrum, complete with targets, outcomes, benchmarks, assessments, impacts and other instruments of modern management; in other words, a grievous betrayal.³¹⁵

It would be, in short, the betrayal of the right hemisphere Master into the hands of the left hemisphere emissary.

'All humanity, including scientists, have to learn to live with mystery; and with mystery should come humility. (Shouldn't it?)' So writes Colin Tudge.³¹⁶ Greek tragedy concerns the effects of *hubris*, the vain delusion whereby man sees himself as being god-like. The result is inevitably catastrophic. Indeed our term 'catastrophe' (from Greek *katastrechein*, to overturn) refers specifically to the dramatic downfall of the victim of *hubris* in Greek tragedy. This ancient insight would appear to be of immediate relevance today.

The importance of humility in the face of the divine is because it is what is proper to divinity, not something demanded by a supposedly petulant God. That would be to misunderstand humility as abasement. And it may prove ultimately that the faithful person's attitude of humility comes *from* the divine element in himself (otherwise known as the soul) and is aimed *at* the divine in himself, and is therefore the divinity properly attending to the divinity. Ruysbroeck's 'God in the depths of us receives God who comes to us: it is God contemplating God.' This has nothing whatever to do with a supposed master-slave relationship. Instead it is, like awe and wonder, not

an abasement but an *ecstasis* (from Greek *ek*, out, + *stasis*, standing), a standing outside oneself while still being oneself. We are both united with something greater than ourselves, in which we share, and simultaneously aware of the separation, in which one feels one's smallness: the union of division and union. (The great is not recognised by the limited, not because the great is not great, but because the limited is limited: 'No man is a hero to his valet; not, however, because the hero is not a hero, but because the valet is – the valet'.)³¹⁷

Lao Tzu said: 'the un-wanting soul sees what's hidden, and the ever-wanting soul sees only what it wants.'³¹⁸ Want requires fulfilment. On the other hand, wonder leads to longing of a spiritual kind, which is fulfilled in itself, 'an unsatisfied desire which is itself more desirable than any other satisfaction', in Lewis's words. 'I call it Joy, which is here a technical term and must be sharply distinguished both from happiness and from pleasure.'³¹⁹ It is a kind of desire that 'is itself desirable' and is therefore 'the fullest possession we can know on earth'.³²⁰ According to him it is what we sense we are made for, but which we can never know in more than intimations – intimations that are nonetheless authentic and beautiful, in such a way as to lead the soul onward:³²¹

The books or the music in which we thought the beauty was located will betray us if we trust to them; it was not *in* them, it only came *through* them, and what came through them was longing. These things ... are not the thing itself; they are only the scent of the flower we have not found, the echo of a tune we have not heard, news from a country we have never yet visited.³²²

It involves a sense of transcendence in which one is transported to somewhere where one is in touch with things beyond the everyday world, that is nonetheless familiar – a sort of long-lost home, as Novalis is supposed to have said.³²³

Even Emil Cioran, who described God's creation as a total failure were it not for the music of Bach, described that same music as a 'ladder of tears on which our longings for God ascend.'³²⁴ We see God through the beauty of this world, but we must not stop there. Hence the importance of that sense of the loss of something beloved and beyond.

Religion or spirituality: a matter of societal flourishing?

Religion can undoubtedly give rise to fanatical behaviour, oppression and cruelty. The evidence is undeniable. But in this it is not unique: so, alas, can any human structure conferring power, since humans are deeply flawed beings. Atheist regimes have been around for only a hundred years or so, compared with the millennia of religion: the evidence is that atheist regimes, such as those of Lenin, Stalin, Mao and Pol Pot, have committed the most extensive atrocities in human history. If we were hunter gatherers we would not need formalised religion. But since we settled, grew our own crops, and built and dwelt in cities, organised social structures, inevitably conferring power, have been unavoidable. And secular ones alone are simply not adequate: that way far too much is left out of our picture of the world. Religion has equal power to do great good, both through its charitable actions, and, even more, by its capacity to bring before the eyes of the mind another realm than the one that is so ‘obvious’ to our gaze – that is ‘too much with us’, as Wordsworth put it; to provide a common moral focus that is not merely pragmatic or politically motivated; to enrich life with beauty and pattern; to revitalise us, celebrate our being in the world for now, and transform what might otherwise seem like meaningless life for the better.

John Gray, in his *Seven Types of Atheism*, makes the point that the values that we hold to be ‘obviously’, even rationally, correct have not seemed so and do not still seem so to societies with other nonetheless coherent codes of behaviour.³²⁵ Jürgen Habermas sees Christianity playing a tacit role in modern society far beyond that of a mere precursor or a catalyst. He, like many others, views our contemporary allegiance to freedom of life, social solidarity, emancipation, individual morality of conscience, justice, and human rights as directly derived from the Judaeo-Christian tradition. The fact that our civilisation has not yet completely fallen apart is a demonstration not that the tradition can be dispensed with, but that it continues, for a while, to be rooted in our psyche. Of its legacy, he says, ‘to this day, there is no alternative to it. And in light of the current challenges of the post-national constellation, we continue to draw on the substance of this heritage. Everything else is just idle postmodern talk.’³²⁶ We are enjoying the afterglow of a fire we are doing our best to extinguish: when it goes out it cannot be rekindled within our lifetime.

Rupert Read links the current ecological crisis to a decline in a collective belief system which was provided by Christianity. ‘Yes, anti-clericalism has brought us to where we are today: a declining culture, bereft of values, and heading rapidly towards complete self-destruction.’ Political liberalism of the Rawlsian type, he holds, is ‘a severe form of tacit anti-clericalism, a profoundly-anti-religious fundamentalism’, in which everything whatever is tolerated, provided that it tolerates (and in practice even if it doesn’t) everything else: ‘toleration has turned to indifference ... In contrast, we need to start to de-indifference our world. We need to seek truths that can re-unite us, that can revive community, not a mere glorified alleged *modus vivendi* that keeps us separate in our private worlds, while the public world declines to ruin’. ³²⁷

This is all the more difficult since a corollary of this form of liberalism is, as Stanley Fish puts it, that

religion must give up the spheres of law, government, morality and knowledge; reason is asked only to be nice and not dismiss religion as irrational, retrograde and irrelevant. The ‘truths of faith’ can be heard but only those portions of them that have secular counterparts can be admitted into the realm of public discourse. ³²⁸

This will not provide us with a moral compass. We turn to science, perhaps, for help; but our faith in science is naïve, since science, as Habermas saw, has no capacity of itself ‘to provide reasons, aside from the reason of its own keeping on going, for doing [what it does] and for declining to do it in a particular direction because to do so would be wrong.’ ³²⁹ The way of being of animist cultures issued in a form of life that endured and flourished for millennia: it led to a certain harmony between man and Nature. There is nothing wholly good or bad; and science, for all its wonderful discoveries, has lost us that capacity. Science is now used to many fine ends; but, alas, inevitably much of the time in the service of the subjugation and destruction of Nature.

Under these circumstances is it enough to be ‘spiritual, but not religious’? That it is hard to know what such a thing means or entails may indeed represent one of its attractions, and I understand only too well why conventional religion is hard to accept for many people these days. I share

many of those feelings. But the one feeling that I don't share is the idea that I can't learn anything from a tradition; that my limited rationalising on the basis of my limited experience in one time and place on the planet is enough. Indeed even such a belief is an outcome of a culture – just one that is in meltdown. Only I can take responsibility for what I believe, hence Habermas's point that individual conscience is a key element in Christianity. But I cannot possibly penetrate to the core of the enigma of life by my own efforts. Nor can I wilfully invent myths or rituals without their being trivial and empty. This is why we have traditions of art, philosophy and, above all, religion. The fetishisation of novelty and the repudiation of history are reflections of a capitalist culture that depends on dissatisfaction with what we have and the constant seeking after new 'improvements' in order to fuel demand. It is not only false but obviously immoral in a number of respects. A culture (and the point of religion is to embody the ethos of a culture) is of critical importance for a society's survival. Cultures are living; but precisely because of that they can be killed. A plant can be flexibly trained, but it cannot be avulsed from its roots and still live. And if our culture dies, so will we who live in it.

In 2014, the RSA in London instigated a series of workshops, debates and events dealing with the question of the nature of spirituality, in a project entitled *Spiritualise*. The report makes interesting reading.³³⁰ One element in it is striking: groups of young people from all over Britain were asked to enter a competition to 'design a service, product, environment, or communications campaign that addresses spiritual needs in contemporary contexts'. Perhaps the left hemisphere terminology contained the seeds of its own failure; but the results showed that 'while the brief was about using design to help reconceive the spiritual in the modern age, most submissions suggested the students did not significantly differentiate between spirituality and wellbeing ... the general impression was of a range of good designs that didn't really speak of the spiritual'.

Smith and Denton reporting on the spiritual lives of American teenagers found a common belief that, as they wryly put it, God was 'something like a combination Divine Butler and Cosmic Therapist',³³¹ who was available on demand but undemanding.³³² This has been popularly characterised as 'benign whateverism'.³³³ Its core is that we should try to be nice, kind, respectful and responsible, and by doing so achieve a state of 'feeling good, happy, secure, at peace.'³³⁴ Worse things might certainly be believed; but

this is not enough to support a civilisation, inspire great art, induce fidelity, inculcate sanctity, motivate self-sacrifice, or lead us to insights into the nature of existence.

When Solzhenitsyn asked himself what had given rise to the catastrophic brutalities of the twentieth century, his conclusion was that men had forgotten God. In a speech given in 1983, he repeated: 'If I were called upon to identify briefly the principal trait of the entire twentieth century, here too, I would be unable to find anything more precise and pithy than to repeat once again: men have forgotten God.' More than this, a positive 'hatred of God', he thought, was the principal driving force behind the philosophy and psychology of Marxism-Leninism: 'militant atheism is not merely incidental or marginal to Communist policy; it is not a side effect, but the central pivot.'³³⁵ The hatred of God is indeed a fascinating phenomenon, one more and more evident in our time – and not just in political philosophies, but in the vox pop of media scientists. Lucifer – 'the Bright' – cannot bear the imputation of anything higher than he.

Jonathan Gaisman, in his reticent fashion, addresses the issue of religion or spirituality. 'It is open to anyone to retain a personalised and entirely individual faith', he says,

but for the majority the natural course at this stage is to reach out to an established tradition, which is most likely to be that in which they were brought up. This is for several reasons. First, like the followers of any other predilection, religious people typically form groups. Second, those groups provide a collective enhancement of the experience shared, as anyone who has been part of a theatre audience will attest. Third, all religions concern themselves with relations between human beings, and prescribe rules of conduct towards one's fellows, so that it is natural for people of faith to reach out to others. Fourth, and perhaps most important, the profound human desire for sacred spaces and rituals is best served by religions whose lengthy past has brought such places and actions into being, polished and veneered by the observances of succeeding generations.³³⁶

Religion performs a role of incomparable importance, whether one believes in it or not, which is why, presumably, it attracts such strong, and strongly opposed, feelings. Ten years before he died, William James wrote in a letter to a friend: ‘I myself invincibly do believe, that, although all the special manifestations of religion may have been absurd (I mean its creeds and theories), yet the life of it as a whole is mankind’s most important function.’³³⁷ I have found that James was rarely wrong. The intellectually wrought specifics are going to be approximate at best: the disposition of the soul is everything.

This great turning of our backs on the sacred began with the Enlightenment. Already in the eighteenth century Schiller prophetically lamented what Weber would later call, in a famous phrase, ‘the abolition of the sacred’. If the words sacred and holy still mean anything to you, then your world must contain the divine. As Blake’s saying ‘all living things are holy’ reveals, for him the world was divine throughout, since to the imagination everything lives. Nowadays, of course, we react to such ecstatic insights with distancing gestures of irony: we are clever. But these are the ways in which we kill the soul. As Friedrich Schlegel declared already, 27 years before Blake died, ‘what gods will rescue us from all these ironies?’ He foresaw what James referred to as ‘pertness’, vain chatter and smart wit.

As we have seen, according to Goethe (and Plotinus before him), aspects of the world call forth in us, if we are open and attentive, the faculties that are needed to respond to them. The faculty to perceive the divine is no exception. Indeed that faculty is what we mean by soul. Soul does not exclude feeling or intellect or imagination, but it is not nearly exhausted by them. Though natural, it can be developed or stunted. Keats, who was wise beyond his years, called this world a ‘vale of Soul-making’.³³⁸ We grow a soul – or we can snuff it out. It is the most important purpose of a culture – any culture – to ensure that such faculties are aided to grow: the invocation of archetypal symbols, the practice of rituals, and the deployment of music and holy words in the approach to the divine have been universal across the world over time. It is only very recently that this universal practice has been abandoned. If you are convinced that in principle you know and can account for everything, you will see only what you think you know. You will never give yourself a chance to know what it

is you might not know. And as Colin Tudge points out, ‘we cannot know how much we don’t know, unless we are already omniscient.’³³⁹

The business of life then becomes like a dance watched by a deaf person: puzzling, pointless and somewhat absurd. Death becomes just the meaningless end of a life itself without meaning. Goodness becomes mere utility, and suffering just frustration of utility. Eros becomes just lust; longing just want; sleep and dreams an inefficiency that we should do away with if we could; art a toy; the natural world a heap of resource; and wonder merely a measure of our failure, rather than, as I believe it to be, a measure of our insight.

We are now in the grip of an obsession with human power and the subjugation of nature, at bottom of which lies our infatuation with technology: the power to manipulate. We have subordinated ends to means. We emphasise self at the expense of others, our rights rather than our duties, what we have rather than who we are, the material rather than the spiritual, and vaunt the reach of the unaided human intellect. In such a world God is a nuisance. ‘Men despise religion’, wrote Pascal. ‘They hate it and are afraid it may be true.’³⁴⁰

When our society generally held with religion, we might indeed have committed many of the same wrongs; but power-seeking, selfishness, self-promotion, narcissism and entitlement, neglect of duty, dishonesty, ruthlessness, greed, and lust were never *condoned* or actively and openly encouraged – even admired – in the way they sometimes are now. In other words, we have lost all shame. And that can’t help but make a difference to how we behave.

Pride and arrogance, believing we know it all, are the opposite of the religious disposition of humility, reverence and compassion. And without them, neither we, nor the whole far greater, astonishing, living world, over which for better or worse we now have the power we so much craved, can thrive. It is pride that will destroy us, and quickly. With so much going for us, rising educational standards, better healthcare, public welfare and humane and stable government, what could be against us? We ourselves. Pride was always considered the greatest of the ‘seven deadly sins’, and it may in the past have proved difficult for many to see why. But the evidence is all around us now; and it is there in the epic narrative of one of the greatest poems of our language, *Paradise Lost*, for all to read.

Let no-one think for a moment that I can exculpate myself from any of this. I find it all as hard as anyone; but sometimes one has to say what one sees, whether one feels a hypocrite or not.

And when we die – when anything dies – what then? Of course we can't know, but as I put forward in the chapter on consciousness, I believe each being is an individuating, and individuated, actualised expression of the potential of consciousness as a whole, which is never ultimately divisible from it. The attachment to self, which is a necessary concomitant of the individuating process while life lasts, at death must be relinquished, but the achievement of thisness, an unfolding or explication of that always unique aspect of the whole, is not swallowed up and lost, but is reincorporated into the now enriched whole. Division and union are unified, without loss of either necessary element of the dipole. Such a view of death seems to me coherent with the rest of what I have put forward in this book.

It is in dealing with death that one is most forcibly made aware of how we have yielded, hands down, to the forgetting of Being. One of the few occasions on which *at last* modern man might be able to grasp the enormity of existence is in the contemplation of death. Yet this is just what we ignore. It is a commonplace that while the Victorians did not talk about sex, they were open about death; we do not talk about death, but are clinically explicit about sex. Unfortunately for us, being open about something robs it of its power, while hiding increases it.

The clergy are no exception to this 'costly aversion of the eyes from death'. Perhaps, like some doctors, some priests – strangely enough – just don't know how to deal with suffering and would prefer everyone to be mindlessly happy. At the funerals of friends and loved ones, they are so anxious that people should not be uncomfortable, or in touch with their natural and healthful feelings of grief, that all sense of a solemn mystery is sacrificed.

When my brother and I had to bury our parents, we asked, mainly for our sakes, for the time-honoured words of the 1662 Book of Common Prayer to be said, just as they are written, since at such times there is something important and moving in the subsumption of the individual life in the common lot of mankind, the ritual of saying the same solemn words that would have accompanied our parents' parents, and their parents' parents, to the grave. Curiously, it is the universality and anonymity that are comforting in the burial service. (There should be no funeral oration on the

life of the deceased. That is quite proper, but on another occasion: for now it is the universal, not the particular, that must be faced.) In any case, at each occasion a different priest assured us that that was what he would do; and in neither case could he bring himself to do so. They managed bits of the rite, it is true; the bits that were consonant with their decent, progressive views. But they omitted anything that seemed to them unreasonably gloomy, or might have suggested that something of consummate importance was at stake. The ancient words no longer sit well in their kindly modern mouths, and are better not said: they come from an age when people still really lived, and really died, seeing life and death *sub specie æternitatis*. Great words, deep words – ‘He cometh up, and is cut down like a flower; he fleeth as it were a shadow, and never continueth in one stay. In the midst of life we are in death ...’ – are read, if at all, in a tone of voice more appropriate for a children’s bedtime story. Yet the point of hearing these words is to remind the living, just for once, of the context in which they lead their lives: something not entirely trivial. Or the supplication: ‘Thou knowest, Lord, the secrets of our hearts; shut not thy merciful ears unto our prayers; but spare us, Lord most holy, O God most mighty, O holy and most merciful Saviour, thou most worthy judge eternal, suffer us not at our last hour, for any pains of death, to fall from thee.’ Words, I suppose, never more to be heard: too powerful, too gripping, too real – there’s not enough irony there for our taste. Perhaps it’s that the language is cast in terms that suggest retribution, in which I no more believe than do the clergy; and hence they avoid them. But that’s not the only way to understand what is being said. In death no-one really knows what we face. But if we are not separate from the rest of creation, the gaining, or regaining, of insight into the whole, and our part in it, might well – it is not too hard to believe – give rise to suffering. The judgment feared comes, then, more from within the individuated soul than from without; the mercy sought comes more from the divine whole than from within. And according to the Christian *mythos*, mercy is ours if desired. The cry for God’s blessing or mercy is ancient, and does not at all depend on judgment in the sense of damnation – more on the sense of fallenness, somehow falling short of something we intuit we might be, and of which we are always aware. Which of us if honest does not feel this? Hence humility, hence reverence, hence compassion for self and others: hence the prayer.

And finally there is the mechanical disposal of the body in a modern crematorium. The burning *ghats* would be quite another matter: it's the clinical, mechanised efficiency invoked. And the loss of the grave: in both senses.

Perhaps the clergy no longer know what to believe – I can understand that. But if, whatever that strange thing one calls one's consciousness may be, it does not end at death – and nobody can be certain that it does – but persists in some form at which we can only guess, there is a real chance that an afterlife might be worse, not just better. I have experienced places in the universe that are real, but not reassuring. Faith is not simply comforting, but puts before one the full tremendousness of being, its meaning and its consequences. If one is a materialist, then there is no meaning in death, apart from the negation of life. Such people live in the comforting thought that life is meaningless, and has only personal consequences or none; then death, too, must be meaningless, and the quicker its acknowledgment is over, and the less grief there is, the better.

But if life has meaning, death has meaning, and if death has meaning, so does life. They interpenetrate one another, and to be anaesthetised to this is to be deceived. 'The fact, and only the fact, that we are mortal, that our lives are finite, that our time is restricted and our possibilities are limited, this fact is what makes it meaningful to do something, to exploit a possibility and make it become a reality, to fulfil it', wrote Viktor Frankl. And he continued:

Death is a meaningful part of life, just like human suffering. Both do not rob the existence of human beings of meaning but make it meaningful in the first place. Thus, it is precisely the uniqueness of our existence in the world, the irretrievability of our lifetime, and the irrevocability of everything with which we fill it – or fail to fill it – that give significance to our existence. ³⁴¹

It may, actually, matter how one lives one's life, because we may play a part in the coming into Being of whatever is, and we cannot separate ourselves from whatever is, perhaps for ever. *Something depends on our way of being, and it is not just we ourselves.* In a world where no-one can avoid the experience of suffering we know that it is a real part of consciousness: suffering is a central element, not just in Christianity, but in

Buddhism, and no doubt in most, if not all, religions. So the how of life, not just the what – its mere existence or non-existence, huge as that is – matters: it has a value and price we cannot fully conceive.

Similarly one life and all life are reflected in one another, as we would see if we looked into the gems of Indra's net. Life requires death; death is the friend of life, not its foe. Goethe wrote: 'all that is to persist in being must dissolve to nothing'.³⁴² According to historian of religion Mircea Eliade, myths from all over the world convey the mutual sustenance of death and life: 'in countless variants', there is a widespread myth that 'the world and life could not come to birth except by the slaying of an amorphous Being.'³⁴³ In one of Goethe's greatest poems, he writes: "Die – and so continue into being!" As long as you fail to see this, you are no more than a forlorn guest on the dark earth.'³⁴⁴ The Latin word *homo* is related to *humus*, the earth, and to *humilis*, humble; and man is 'made of the dust of the earth'. Another ancient word for man is the Sanskrit *marta*, 'he who dies', cognate with Latin *mortalis*. I understand the Christian belief in the redemption of death through God's own suffering to mean that death is not an end, but plays a part – like the intermediate phase of destruction, of fragmentation, of the shattering of the vessels – in the greater story of repair and restoration; a story that is both mine and not mine, taking place in the immensity of a living cosmos where the part and the whole are as one, yet without the loss of the meaning of the part that is each one of us.

Or so it seems to me.

EVIL

Ein-sof, the infinite God, is a ‘unity of opposites’, reconciling within itself even those aspects of the cosmos that are opposed to or contradict one another:

Sefer yetzirah, an early (third to sixth century) work which was of singular significance for the later development of Jewish mysticism, said of the *Sefirot* that ‘their end is imbedded in their beginning and their beginning in their end’.³⁴⁵

The idea of the eternal return, founded on an eternal cycle of life and death, creation and destruction, each requiring the other for its fulfilment, is imaged in the ancient Egyptian sacred image of the *ouroboros*, the serpent eating its own tail, which surrounded the cosmos and kept it alive. But the foundational work of Kabbalah, the *Zohar*, takes the image imaginatively into a new realm: ‘The Holy One, Blessed be He, has curled a serpent around the realm of holiness’.³⁴⁶ According to the *Zohar*, there is no path to holiness except by way of the serpent – the shadow side. The journey always involves an encounter with something you have to be courageous enough to withstand.

The ‘problem of evil’ is as ancient as humanity. It seems that we need resistance in order for moral issues to stand forth or for moral goals to be achieved. Too easy a life leads us to complacency. The Duke in *As You Like It*, banished from court to the forest of Arden, finds that

Sweet are the uses of adversity,
Which, like the toad, ugly and venomous,
Wears yet a precious jewel in his head;
And this our life exempt from public haunt,
Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in every thing.³⁴⁷

George Herbert, too, believed that excessive comfort dulls our ability to seek God. In his poem 'The Pulley', he describes how God bestowed on humanity all the blessings that he could, though deliberately withholding rest, for fear that we would then remain satisfied with what we knew, and never seek its source beyond, in God's self. From that point of view there is something in the idea that – in accord with the *coincidentia oppositorum* – the better it gets, the worse it gets; and the worse the better.

The recalcitrance of the world seems to me, incidentally, also a guarantee that it is to some degree independent of us, not wholly determined by us. While we cannot ever be absolutely sure that the world is not simply a fabrication of our own minds, the element of resistance, if nothing else, holds an important clue. If there were no mind-independent world, the fact that wishing does not always make it so would be hard to explain.

Resistance in nature is the cause of suffering, but, by the very same token, of creativity. According to Paul Cilliers, a philosopher of complex systems, 'for self-organisation to take place, some form of competition is a requirement'.³⁴⁸ Self-organisation means thriving: adapting, creating, fulfilling potential and surviving. In Nietzsche's famous phrase, that which does not kill us makes us stronger.

The existence of suffering in nature is every bit as real as the existence of exultant life and beauty: we may not focus on either to the exclusion of the other. And it is one of the oldest and most pressing problems in philosophy and theology. It seems that everything exists only as a dipole, a coincidence of opposites. Ruskin thought that beauty required the existence of ugliness, much as Blake thought there must be sadness in heaven if there was to be joy; Nietzsche called happiness and misfortune 'two siblings and twins who either grow up together – or ... *remain small* together!'³⁴⁹ They are like the opposites that Heraclitus and Anaximander saw as not just an incidental *aspect* of existence, but the core of existence itself: the structure of the world conceived as counterpoint. (See Plate 24.)

Ursula Le Guin's searing short story, 'The ones who walk away from Omelas',³⁵⁰ describes a city of extraordinary beauty, whose people lead lives of delight, great wholesomeness and vitality. They are a morally and politically sophisticated society, technologically not advanced, but living peacefully in a glorious and celebratory harmony with Nature, and with one another, without either rulers or slaves. However, those who grow up there

come to learn that there is a dark secret on which the very life of the community depends: a child who is kept prisoner in a lightless basement, where it leads a squalid and desperate existence:

Some of them understand why, and some do not, but they all understand that their happiness, the beauty of their city, the tenderness of their friendships, the health of their children, the wisdom of their scholars, the skill of their makers, even the abundance of their harvest and the kindly weathers of their skies, depend wholly on this child's abominable misery.

Some go to visit in order to confirm for themselves the truth; others prefer to rely on what they are told. Some are able to put out of mind what they have seen, and accept it as the necessary price to be paid for the welfare of the community at large. But some who go to visit are haunted by what they know; one day, sooner or later, they become the ones who walk away from Omelas. Whither they walk we do not know; or whether they are fortunate in finding a place whose beauty and goodness is bought at a less costly price. LeGuin's concluding words are equivocal:

The place they go towards is a place even less imaginable to most of us than the city of happiness. I cannot describe it at all. It is possible that it does not exist. But they seem to know where they are going, the ones who walk away from Omelas.

If there is a force for good, there must be a force for evil. I don't flinch from such a conclusion. I think I have seen forces both for good and evil at work during my lifetime, and I think, that seeing them as forces, having dynamism, initiative, and purpose, is to me more truthful than seeing them as inert abstractions of the mind – abstract nouns, as is our way, derived from adjectives we use to describe behaviour we happen to like and behaviour we happen not to like. I think as our civilisation breaks down, we will all be able to identify these drives more clearly. But, if the thesis of this book is right, though they may be polar opposites, they cannot be wholly separate. And they will not be wholly equal.

As many mystical writers have intimated, the divine must be capable of encompassing in some form its opposite, while not, nonetheless, being diminished by this inclusion.³⁵¹ But does divine containment also have the power to embrace, to constrain, and to set limits to whatever it may be: even to change its nature? If so, is this not a trick? As a teenager, wrote Jung, 'Faust struck a chord in me and pierced me through in a way that I could not but regard as personal. Most of all, it awakened in me the problem of opposites, of good and evil, of mind and matter, of light and darkness'.³⁵² The problem of opposites is central to Faust because it was a recurring source of fascination and inspiration to Goethe, too; both Goethe and Jung saw that opposites extended far enough reach the same point.

I experience both good and evil as real, and see them as necessary opposites; but while evil can, goodness knows, locally overwhelm good, it cannot subsume good into itself. The goodness of love can embrace its opposite; the evil of hate cannot. As we saw in Chapter 20, opposition has it in itself to become a union of opposites, but only by the forces of union, not by those of opposition.

The easiest way to deal with evil is to deny its existence. In a society that is unwilling to countenance the existence of a moral force of any kind, and sees good and bad as merely labels we use to indicate degrees of societal approval, this recommends itself as the easiest path. For most of us, evil is just behaviour we disapprove of more strongly, and the term is thought better avoided, as it has no explanatory power.

Yet I cannot see this as satisfactory when we are faced with the dynamism of sheer wanton cruelty, the lust to destroy and cause suffering, that delights in power for its own sake. It can't be denied that it exists. And power is the key: power is a form of *energy*.

In contemplating totalitarianism and its atrocities, such as the Nazi death camps, Hannah Arendt speaks of 'radical evil', by which she means a form of wrongdoing which is not captured by other moral concepts. Central to it is the making of humans into things, devitalised automata, living corpses without will or spontaneity. 'According to Arendt a distinctive feature of radical evil is that it isn't done for humanly understandable motives such as self-interest, but merely to reinforce totalitarian control and the idea that everything is possible.'³⁵³ In other words, the self of the evil-doer, too, is destroyed, in the service of a power greater than itself, the ideal

of which is simply – power. Power to do anything and everything possible. We have that lust within us.

For those who recognise a moral force for good, derived from God, the problem is different, and more acutely embarrassing. If God is omnipotent, why evil? The traditional Neoplatonic answer is that evil is mere privation of good. This seems to me an intellectual gambit only. Christians especially must take into account that Christ, according to the gospels, was tempted by Satan; and taught his followers to pray continually to be delivered from evil – not just to avoid not being quite good enough. If your belief in God stems from the refusal to deny an experienced reality, I suspect denying the reality of evil in experience is like putting the telescope to one's blind eye. Moreover, intellectual gambit that it may be, it does not really work; since why, if God is omnipotent, is privation possible? To me it makes more sense to deny God's omnipotence, of which I have no experience, than deny either God or evil, of both of which I do.

One way of thinking of this (it is hardly original) is that a divine principle of love needs something Other to love, since love is essentially directed outwards; that that Other must be free to respond, since a love that is compelled is not love; and that this necessarily means that the Other must be free to reject the love that is proffered. This seems to me necessarily true, if such a divine principle of love exists. To reduce the living spontaneity and freedom of a being to mere automaticity of behaviour would be, after all, to bring about, precisely, Arendt's idea of 'radical evil'. God's powers are limited here essentially, rather than accidentally, much as no God could be expected to make $2 + 2 = 17$. It can be argued that in God's creation there is a *kenosis*, a deliberate renouncing of power, much as *tzimtzum* is the self-limiting act of *Ein-Sof*. But at the end of the day, renunciation of power, a setting of limits, is still what it says on the tin.

The drive to evil comes from somewhere – and I do think it is a drive. In the Kabbalah, mankind has both an innate tendency to good (*yetzer hatov*) and an innate tendency to evil (*yetzer hara*).³⁵⁴ Here the same logic applies, that humanity must be free to choose. But the tendencies are built into the way things are. No-one seems keen to say why.

I admire the serenity of those Buddhists who are able to say 'not two', and see the whole concern about good and evil as a misunderstanding caused by making false distinctions; but I find it difficult to share this serenity (especially in the face of the Holocaust, and a myriad other

examples of innocent suffering). And while I indeed believe the endpoint is right, that the two eventually come together, and that we cannot know what good may flow from what we now call evil, or what evil may flow from what we now call good – Jung’s enantiodromia – my response to ‘not two’ is ‘yes, but ...two’; as my response to ‘two’ is ‘yes, but ...not two’. To my way of thinking, something here is at risk of being short-circuited. The *coincidentia oppositorum* involves *both* the union *and* separation of good and evil. It is not possible to get round that. I am reminded again of Escher’s ‘Angels and Devils’ (Plate 24.)

In Taoism, good follows from absolutely abjuring human will and following the spontaneous flow of Being: bad occurs only when humans strive against the *tao*. It is left unspoken, however, why humans alone, being themselves inevitably an expression of the *tao* like all other creatures, strive against the *tao* and exert an opposing will. But, though there is here no God as such, rather a creative force that grounds and orders the cosmos, this is not really different in its structure from the Christian *mythos* of evil – Milton’s *Paradise Lost* being perhaps the most psychologically sophisticated expression of it ever written, an account written after Milton had gone totally blind, and during the bloodiest civil war in England’s history: he probably understood his subject. His Satan was formerly Lucifer, the most beautiful of all angels, not an evil creation. What makes Satan evil is a disposition: pride, envy, resentment, anger and a delight in exercising power to assail the divine order. Satan seduces Adam and Eve to eat the fruit of the tree of the Knowledge of Good and Evil. It is said that the meaning of the Hebrew words translated as good and evil ‘mean precisely the useful and the useless, in other words, what is useful for survival and what is not’³⁵⁵ – which happens to characterise the value structure of the left hemisphere (and of modern society): utility above all else. And, for us, utility has become the Good. It leads us onwards towards the abyss.

The Kabbalah is once again an invaluable resource. Luria held that the divine principle of the cosmos is both *Ein-sof* (that which is without end) and *Ayin* (absolute nothingness). He also held that creation is both an emanation and a contraction (*tzimtzum*); that *Ein-sof* is both the creator of the world and itself created and completed through the spiritual, ethical and ‘world-restoring’ acts of humanity (*tikkun*, repair); and, finally, that the *Sefirot* both are the originating elements of the cosmos and are only fully

realised when the cosmos is displaced and shattered (*shevirat ha-kelim*, the breaking of the vessels).³⁵⁶ This is redemption: it is from the divine sparks within the shards of the vessels that this greater unity, this fulfilment of creation, this redemption, is achieved, so that ‘a world that is alienated from and then reunited with God is superior to one that had never been alienated or divided at all’:

this return to the primal unity is all the more exalted for having passed through the dichotomies and multiplicities of a finite world; for such a restored unity is not simply a restoration of the original divine oneness, but is actually the completion and perfection of *Ein-sof* itself. According to the Kabbalists, it is incumbent upon humankind to recognize and even facilitate the distinctions within the finite world, while at the same time, through an appreciation of the coincidence of opposites, to comprehend the unity of all things.³⁵⁷

Returning to the Iroquois myth with which I began Chapter 20, both brothers are sons of heaven. One, He Grasps the Sky With Both Hands, remembers his divine origins: the other, Flint, does not. He relies on language and tools to do as he wishes (‘I trust in the thing which my father gave me, a flint arrow, by which I have speech’). He Grasps the Sky With Both Hands can, on his own, create the panoply of life; Flint can create only monsters. His attempts to do so result in deformities, which his brother accepts and does his best to redeem. Flint’s creatures do not live, until He Grasps the Sky With Both Hands puts some of his own life force into them. Flint is proud, envious and delights in his own power; his brother realises that to constrain this power, he must keep his brother, who represents ‘evil in the form of ... intentional forgetfulness of the higher identity’, close to him, so that as much good as possible can come from the work of both of them – but not too close, since Flint ultimately desires his brother’s destruction.³⁵⁸ There is, on the one hand, the real human being, made by He Grasps the Sky With Both Hands alone, perhaps like Adam and Eve before the fall, perhaps like the soul, in Cottingham’s phrase, pointing to ‘the better selves we are meant to be’;³⁵⁹ and, on the other, there is the hatchet maker, the bringer of strife – the human beings we are. He Grasps the Sky With

Both Hands warns us that Flint's anger has created a fire that 'will burn eternally in that my brother even now desires to control all minds among human beings.' We must struggle to avoid it. He Grasps the Sky With Both Hands will come to our aid – twice: but

if a third time it comes to pass that you forget, then you will see what will come to pass. The things upon which you live will diminish so that finally nothing more will be able to grow ... It will be my brother who will do all this, for he will be able to seduce the minds of all human beings and thus spoil all that I have completed. Now I leave the matter to you.

I have nothing to add.

CODA TO PART III

AS I MAINTAINED AT THE OUTSET OF THIS BOOK, COMPLEX AS THE CONCEPT of truth may be, it is indispensable: some things are truer than others. The first two Parts of this book have been devoted to exploring how we could maximise the chances of encountering truth, given the contributions made by each brain hemisphere; and, Part III, devoted to how on adopting such an approach the cosmos would appear to be constituted.

In Part I, I showed that in relation to the main portals of access to knowledge – attention, perception, judgments formed on those perceptions, social and emotional intelligence, cognitive intelligence and creativity – while both hemispheres contribute, the right hemisphere is in every case superior to the left. Only in the business of grasping something in order to use it is the left hemisphere superior. I also showed how we can now *recognise* what is contributed to our synthesised world-picture by each hemisphere, and thus, *ceteris paribus*, how much weight to accord to the contribution. That is an advance in understanding in itself.

In Part II, I considered each of four main pathways to understanding: science, reason, intuition and imagination. My conclusion was that we should never rely on one pathway alone, and that, where appropriate and possible, all four should be brought to bear. I also concluded that in each case, while again both hemispheres make a contribution, it is the contribution made by the right hemisphere that is ultimately of greater importance in arriving at a full understanding. In practice we in the contemporary West tend to restrict ourselves to one, sometimes two, of these pathways at any one time, and, moreover, often neglect the more

important right hemisphere contribution to those on which we do choose to rely.

In Part III, I have looked at the ‘stuff’ of which the cosmos is made – time, space, motion, matter, consciousness, etc – as well as why we might see it as divine in nature. And its apparently paradoxical nature. I suggested that paradox generally resulted from the clash between the ways in which the right and left hemisphere construe reality. ‘One way to unify things that appear different is to show that the apparent difference is due to the difference in the perspective of the observers’, writes physicist Lee Smolin. ‘A distinction that was previously considered absolute becomes relative. This kind of unification is rare and represents the highest form of scientific creativity. When it is achieved, it radically alters our view of the world.’¹ When one applies the lens of the hemisphere hypothesis to important issues in philosophy, including the philosophy of science, many can be seen, I suggest, as reflecting, at one level, a conflict between the two ways of looking at the world that are typical of the two hemispheres.

The thinking of our culture is still dominated by the superannuated, eighteenth-century model of mechanistic reductionism, despite the discoveries of quantum physics and an increasing understanding of complex systems, neither of which is compatible with it. Such a way of thinking posits that the cosmos is a purely material machine, in principle fully comprehensible by analysis into its parts. It is determined, rather than freely creative. And the whole farrago is without any meaning or purpose. So it is said.

This view is far removed from what physics tells us of the reality which it is thought to describe. But – here is the beauty of the alternative view I am recommending – this conventional view does not have to be wholly dismissed. In fact it *must* not be. It is not without its elements of truth – just very limited ones by comparison with the understanding of the right hemisphere. A map contains some truth, but unless you can interpret it in the light of real-world experience, it is useless. And although a map depends on the world, the world does not depend on a map. The map is a special case of the world, by which it is included, not the world a special case of the map. This is an important point because it is sometimes assumed that if you can break the world down, by the same process you could build it up. As the theoretical physicist Philip Anderson once put it, ‘the ability to

reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe'.²

As always there is an asymmetry: the right hemisphere's take is in no sense a special case of the left hemisphere's, but that of the left hemisphere is a special case of the right's, which already includes it.

I argue that the reductionist paradigm has had a good run for its money, but its time is over. We need a new one: like any paradigm, the new one can be no more than a working model, but I believe it is one that makes a better fit with everything we know from experience, by which I mean all that can be learnt from science and reason at their best, in combination with intuition and imagination at theirs. It is a paradigm supported by the argument and evidence in this book, from brain science and from physics, and by several increasingly important schools of thought, especially those of the Pragmatists, process philosophers and phenomenologists, as well as ancient bodies of wisdom, of both East and West, that have never been of greater consequence than they are today. That confluence alone is striking. This paradigm is in accord with the understanding of the brain's right hemisphere, which, I hold, has evolved to be our primary means of comprehending the world, while the left hemisphere has evolved to execute procedures that serve our will in manipulating the world. On such a basis, even if this alternative paradigm did not seem a much better fit with our knowledge and experience, it would be *prima facie* an account less likely to deceive us. But it does seem a better fit. And the right hemisphere also has the capacity to unite what the left hemisphere offers with its own understanding, in a way that the left hemisphere cannot.

What is this right hemisphere understanding? In line with Bohr's insight, it holds that the deep truths about reality are likely to appear initially paradoxical. What look like things – with inevitable suggestions of stasis, certainty and fixity – are processes; and all such thing-like processes are interdependent with others, bringing one another into being. Everything is changed by context; strictly speaking the context is everything else that exists or existed, but for practical purposes we mean by it that part of the net of interrelations which, due to proximity or potency, has the greatest part to play in constituting whatever it is on which we are focussed at the time. All parts may be considered as wholes in relation to some lesser parts, and all wholes may be considered as parts in relation to some greater whole. The whole which a part goes to make up tells us as much about the nature

of the part as the parts reveal about the nature of the whole. Relations are not secondary to *relata*, and it may be argued that *relata* may be secondary to relations, as the nodes in a web are secondary to the intersection of the threads (think Indra's net):

According to the prevailing theory, as the universe evolved after the Big Bang, matter became distributed in a web-like network of interconnected filaments separated by huge voids. Luminous galaxies full of stars and planets formed at the intersections and densest regions of the filaments where matter is most concentrated.³

In quantum field theory, the absolutely primary elements of reality are force fields, that is to say relationship and process, not things. Moreover things emerge from processes in the 'Standard Model':

In the Standard Model of Particle Physics, which is the best theory we have so far of the elementary particles, the properties of an electron, such as its mass, are dynamically determined by the interactions in which it participates ... No longer are there absolutely 'elementary' particles; everything that behaves like a particle is, to some extent, an emergent consequence of a network of interactions.⁴

And, of course, consciousness takes part in their being. There is absolutely no reason to believe matter to be ontologically prior to consciousness: there is only a prejudice that now needs to be retired.

The cosmos is in process, one in which the potential that is in-folded within being is constantly unfolding into actuality and then being re-folded into the now enriched whole, in a cycle that endlessly returns. But to see the bigger picture, one has to see not only the actual, but the potential through and behind the actual. This means having always before one's eyes the bigger *Gestalt* from which the actual comes and to which it returns; being able to remember, while in the field of actuality, the potential out of which it arises and to which it contributes its part, for a time. The first thing we learn about the twin brothers is that He Grasps the Sky With Both Hands does not forget his higher identity in the midst of action in the world; while

his brother Flint declares: 'I am not thinking about the place from where I came ... It is sufficient that my mind is satisfied in having arrived at this place.'

I have also suggested that whatever creative energy underwrites the unfolding of the phenomenal universe is continually active and involved in that universe. This is a teaching which in one form or another is at the core of almost every ancient mythology, every religious tradition, has literal truth in terms of physics, and is true to a Whiteheadian vision: that of the world and a creative dynamism forever bringing one another into being.

This also touches on what, in *The Master and his Emissary*, I referred to as the ontological asymmetry of the hemispheres. In doing so I quoted Blake's saying that 'Energy is the only life and is from the Body; and Reason is the bound or outward circumference of Energy'. Our power to conceptualise, then, according to Blake, is parasitic on and derives any vitality it may seem to have from being the very boundary, the limit place of that Energy. The right hemisphere, being the primary mediator of experience, from which the bloodless, conceptualised, re-presented world of the left hemisphere derives, is never remote from the creative energy of the body, the emotions and life: it is involved in the world, though aware of there being much beyond. He Grasps the Sky With Both Hands brings the human form to life with life of his own, giving it of his own blood, his own consciousness and his own breath. The left hemisphere, He Who Is Crystal Ice, He Who Is Flint, is 'satisfied in having arrived at this place'. He has got his words and his arrows. He has forgotten where he derives his energy from. And so He Grasps the Sky With Both Hands says of their joint creation, the hatchet maker, the bringer of strife: 'I see he will become hostile to me ... What will come to pass because of that?'

EPILOGUE

You live in a deranged age – more deranged than usual – because despite great scientific and technological advances, man has not the faintest idea of who he is or what he is doing.

—Walker Percy¹

The great departs; the small approaches.
Thus heaven and earth do not unite,
and all beings fail to achieve union.
Upper and lower do not unite,
and in the world, states go down to ruin.

—I Ching²

Strength lies in improvisation. All the decisive blows are struck left-handed.

—Walter Benjamin³

I OFTEN FEEL SYMPATHY FOR NOVELISTS AND CRIME-WRITERS, WHO MUST BE aware that there is a type of reader who will leap straight to the final chapter to discover whodunnit even before anything has been dunn. It destroys, of course, one of the pleasures of reading the book. Authors of books such as

this one are not immune from the same problem, and in our case it is even worse. Readers who turn first to the final chapter often do so as a substitute for reading the book as a whole, and inevitably come away with a much cruder idea of what the book suggests. Final chapters, epilogues, and other ‘last words’ can contain none of the subtleties, complexities or indeed the caveats, of the book itself. Yet some sort of concluding chapter is almost always necessary.

However, I have to disappoint the casual browser. Let me state clearly that what follows is in no sense even an approximate ‘summary’ of the book’s argument. It isn’t a summary at all.

I feel my loyalty is to those readers who have accompanied me from the beginning and have arrived at this point in the conventional manner. I therefore see paying my debt to them as my showing how what, at times, might have seemed somewhat remote from the concerns that press on us – discussions of the nature of time, space and movement, for example – nonetheless bear directly upon our experience in the world today. In the book I have put forward for the reader’s consideration a form of cosmology – and, in the simplest sense, a philosophy of life: all of that was best expressed where I took time to do so, and to express it less carefully now would be both superfluous and counterproductive. This epilogue, then, presents not a backward glance at where we have been, but a projection forward into the plight of our contemporary world, and how that philosophy may be of relevance here.

Those who read only what follows rather than the book as a whole may be tempted to see here the conventional ‘conclusions’ which a final chapter might provide. If so, they might well protest that the ‘conclusions’ are nothing new. In one sense they are right – there is nothing new under the sun. All I hope to do in these last pages is hint at how our exploration of the brain and its contributions to mind can help us see things we might not otherwise see, and which indeed we are no longer permitting ourselves to see; see new connexions between otherwise disparate phenomena; and see what we *do* see in a different light. Whether I have succeeded or not, however, can be judged, I would suggest, only by those who do, in fact, read the book.



It is often said that we are experiencing a crisis of meaning. Not coincidentally, far more of us than ever before in the history of the world live divorced from Nature, alienated from the structures and traditions of a stable society, and indifferent to the divine. These three elements have always been what have provided us with an overarching sense of belonging: our relations with the living world, with one another, and with a divine realm. (They also turn out from contemporary research, unsurprisingly, to be the three elements that most determine one's happiness and fulfilment as a human being.)⁴ Alas, they are no longer open to us: we have seen to that. We exist in the world, of course, but we no longer *belong* in this world – or any world worthy of the name. We have unmade the world. This is entirely new in the history of humanity and it is impossible to exaggerate its significance.

Each of these divorces has come about very swiftly – in a mere 250–300 years – the twinkling of an eye in relation to the age of humanity. And they have each come about because of an access of hubris. Nature has become mere resource; the divine mere superstition; and the unruly complexity of life can, we believe, be simply rationalised, ironed out, and subjected to our conscious control, by technology, by bureaucracy and, where necessary, by law. We know far more, we think, than people of other ages and cultures; indeed we pretty much know it all. However, I suggest, no people that ever lived has understood so little.

In the ninth-century Chinese classic, *The Secret of the Golden Flower*, it is written that 'the conscious mind is like a violent general of a strong fiefdom controlling things from a distance, until the sword is turned around.'⁵ The sinologist Thomas Cleary comments: 'Zen Buddhism traditionally describes the mechanism of delusion as mistaking the servant for the master. In the metaphor of this passage, the general is supposed to be a servant but instead usurps authority.'⁶

In both the Zen and Taoist traditions, the narrowly circumscribed conscious mind, according to Cleary, 'is supposed to be a servant of the original mind' – original here meaning the ontologically prior and deeper-lying mind, on which the 'conscious mind' depends for understanding. When 'the sword is turned around ... the original mind retrieves command over the delinquent conscious mind'.⁷

In a subsequent passage Cleary adds, unknowingly, but precisely, describing the way in which the two hemispheres work best together (the

interpolations in square brackets are of course mine):

Intuition belongs to the original spirit; intellect belongs to the conscious spirit. The essence of Taoism is to refine the conscious spirit [LH] to reunite it with the original spirit [RH] ... self-delusion occurs when the servant has taken over from the master; self-enlightenment takes place when the master is restored to autonomy in the centre.

As he points out, this is an image of ‘an ideal relationship between the original spirit as the source of power and the conscious spirit as a subordinate functionary’:

In this way the intellect [LH] functions efficiently in the world without that conscious activity inhibiting access to deeper spontaneous knowledge through the direct intuition of a more subtle faculty [RH].⁸

Why is the sword said to be turned around? Because the highest achievement of the analytic intellect – and this only very rarely happens – comes when it knows when to stop: how to turn its power, where necessary, on itself, so as to see its proper limits and to abide by them. To quote Heidegger once more, ‘The evil and thus keenest danger is thinking itself. It must think against itself, which it can only seldom do.’⁹

I dare to hope that this book may aid in one of those rare instances of the intellect’s becoming aware of its own limitations; coming once more to play the invaluable role of servant, rather than pretending to be the Master, without having any of the necessary insight into, or wisdom about, what it is doing.

In *The Master and his Emissary* I laid out, first, the neuropsychological grounds of the hemisphere hypothesis and its philosophical consequences; and, then, what I could see happened to a civilisation when its ethos, instead of encouraging the proper working together of the hemispheres, began to favour a very particular outlook, one that can readily be shown to conform to the mode of operation of the left hemisphere alone. I did this by reviewing the major turning points in the history of ideas in the West

through the lens of that hypothesis, which to me provided a grave warning. I was, and am now still more, fearful that unless we *radically* change the path we are pursuing we cannot survive – certainly as a civilisation, and perhaps as a species. In the last chapter of that book I asked the reader to imagine what the world would look like if I were right that we had more or less confined ourselves to seeing it from the very narrow, highly skewed, standpoint of the left hemisphere. Few readers have needed much prompting to recognise in it the world where we live now.

Any reader of this book will, by now, be very familiar with the consequences of the view made possible by the left hemisphere. So I will not need to spend much time on them: the most obvious of these can be listed fairly succinctly. In each case we achieve the opposite of what we intend.

OUR LEFT HEMISPHERE WORLD: 'ARROGANT DRAGON WILL HAVE CAUSE TO REPENT'

We have lost the sense of the broad picture, and the feeling for the whole, resulting in despoliation of the planet, exploitation of poorer nations, and extinction of the way of life of indigenous peoples. We have for some time now disregarded, and latterly traduced, the ancient wisdom of our cultures, and simultaneously acted with contempt for future generations. Social cohesion is breaking down in the face of atomistic individualism; and we are experiencing an epidemic of depression, anxiety and loneliness. Context is absolutely *essential* to the understanding of every utterance and every deed; yet we neglect the importance of context, so that words and deeds are ripped from their anchors in life and subject to comprehensive misunderstanding – all of which is exacerbated by the Procrustean effect of soundbite culture, and by the fragmentation of our attention. We sit in judgment on other times and other places, the art, literature and history of the past, and other people's cultures; yet we have no idea how very weird our own values are when set in context. We neglect all that is implicit, which is nine-tenths of what matters, and which can't be made explicit without destroying its meaning and value: this is even affecting our ability to understand tone of voice and to read faces. The 'what' has come to triumph over the 'how', the goal over the means, the brute 'this must be done' over the manner in which it is done. There is a growth of machine-like inflexibility, loss of judgment and discretion, and a culture of petty rules that strangle initiative and affront our humanity. We are witnessing the triumph of black and white judgments, especially in the 'culture wars', where there is no vestige of subtlety in our thinking,¹⁰ no patience for the complex, and often little or no empathy, but rather anger and self-righteousness. We are newly beset by a tyranny of literal-mindedness – affecting our capacity to understand metaphors, humour, and irony, which increasingly are being driven out of public converse and out of our lives. We have replaced the living and unique by simple categories everywhere: a tick-box mentality. We have substituted quantity for quality – and 'productivity' for creativity (another aspect of the 'what' killing off the 'how'). We have an insatiable need for control – approaching total control,

not just of action, but now of thought, through surveillance by both state and global capitalism. We are engaged in a war on the body, since it resists our free fantasies of limitless possibility, even if only by ensuring that one day we die; simultaneously we deny the existence of the soul, which is not something that exists over against embodiment, but is enmeshed with it. We kid ourselves that frenetic activity is a sign of life, not the desperation of people who have no idea what they are doing or why they are doing it, locked into a competition they cannot see how to escape; and which is destroying the world. And all this is accompanied by a blind optimism, born of the denial of consequences. Every aspect of this reflects, as the reader will recognise, a prepotency of the left hemisphere's *modus operandi*. In Parts I and II, we saw how this leads, literally, to delusion; and in Part III, by revisioning the world, I drew attention to how we are unmaking it.

We are out of touch with reality, to which the right hemisphere's world-picture would still give us access, if only we didn't dismiss it. In our world, the real, possibly cataclysmic, threats we are facing are in effect denied, while in their place new, hitherto unimagined, 'threats' to our sensitive natures are invented, which then proceed to take up a disproportionate part of our attention. It puts me in mind of a patient I looked after who, following a right hemisphere stroke, was not the least bit concerned that the whole left side of her body was paralysed – indeed, like many right hemisphere-damaged patients, she denied that it was so; but she was absolutely convinced that she was being victimised by a patient in the next bed, who had, she thought, contrived to steal her magazines and subtly poison her food.

One of the themes of this book has been that when we don't truly understand what we are doing and why we are doing it, life appears 'paradoxical': we set out to achieve one end and reach its exact opposite. Indeed, because of our unusual world view, we are constantly in a state of surprise about the way our plans don't work out. (When I say 'we', I acknowledge that many of my readers will object that they are no part of this; that is good, but you must then accept that you are the dissidents on whom nothing less than our future depends.)

As a society, we pursue happiness and become measurably less happy over time. We privilege autonomy, and end up bound by rules to which we never assented, and more spied on than any people since the beginning of time. We pursue leisure through technology, and discover that the average

working day is longer than ever, and that we have less time than we had before. The means to our ends are ever more available, while we have less sense of what our ends should be, or whether there is purpose in anything at all. Economists carefully model and monitor the financial markets in order to avoid any future crash: they promptly crash. We are so eager that all scientific research result in 'positive findings' that it has become progressively less adventurous and more predictable, and therefore discovers less and less that is a truly significant advance in scientific thinking. We grossly misconceive the nature of study in the humanities as utilitarian, in order to get value for money, and thus render it pointless and, in this form, certainly a waste of resource. We 'improve' education by dictating curricula and focussing on exam results to the point where free-thinking, arguably an overarching goal of true education, is discouraged; in our universities many students are, in any case, so frightened that the truth might turn out not to conform to their theoretical model that they demand to be protected from discussions that threaten to examine the model critically; and their teachers, who should know better, in a serious dereliction of duty, collude. We over-sanitise and cause vulnerability to infection; we over-use antibiotics, leading to super-bacteria that no antibiotic can kill; we make drugs illegal to protect society, and, while failing comprehensively to control the use of drugs, create a fertile field for crime; we protect children in such a way that they cannot cope with – let alone relish – uncertainty or risk, and are rendered vulnerable. The left hemisphere's motivation is control; and its means of achieving it alarmingly linear, as though it could see only one of the arrows in a vastly complex network of interactions at any one time. Which is all it can.

If these paradoxes surprise us it is because we have not thought far enough ahead in time or broadly enough in space: we take a small part of the complex for the whole. The awareness coming from the right hemisphere can embrace that of the left, but not the other way round. When the hemispheres are working together under the unifying influence of the right hemisphere, the effect is not purely additive, but transformative. However, since the left hemisphere not only 'takes in' less, but understands what it takes in less well, our almost exclusive reliance on it, the servant, in contemporary Western culture, is a problem of some considerable proportions. Indeed, like civilisations before us, which drifted further and further to the outlook of the left hemisphere, we would appear to be

engaged in committing suicide, intellectual and moral – if not indeed literal; excluding whole aspects of reality, resulting in a version of the world that ‘computes’ as far as the left hemisphere is concerned, but is grossly impoverished and lacking in meaning. One that is, in sum, more fit for a computer than a human being.

The focus of our thought is constrained because we think in terms of linear systems, when linear thinking is inadequate to the task. The result is what David Bohm called ‘sustained incoherence’, and its manifestations are all around us. He linked it to what he calls ‘thought’, which is clearly a description of left hemisphere thinking, even down to the denial:

There is another major feature of thought: *thought doesn't know it is doing something and then it struggles against what it is doing*. It doesn't want to know that it is doing it. And it struggles against the results, trying to avoid those unpleasant results while keeping on with that way of thinking. That is what I call *sustained incoherence*.^{[11](#)}

Later he has this to say: ‘If there is sustained incoherence, it just keeps on going in spite of the fact that there is evidence which would show that it's incoherent. Now, we could say that an intelligent response on seeing incoherence would be to stop it, to suspend it and begin to look out for the reason for the incoherence and then to change it. But I say there is a defensive incoherence’.^{[12](#)} In other words the left hemisphere, above all else, doesn't want to hear why it might have got things wrong, as we have seen in this book time and time again.

I see widespread evidence of this strange mentality in corporations, governments, health systems and education – everywhere that management ‘culture’ holds sway – that when things go wrong it is never that we have been travelling in the wrong direction, or have gone too far in what may once have been the right direction, only that we have *not gone far enough*. This links to the Dunning-Kruger effect: the less you know, the smarter you think you are. A further finding by Dunning and colleagues, however, helps make clear the relationship with the left hemisphere mindset, not only because of its relatively blinkered vision, but because of its preference for simple linear algorithms and procedures that ‘logically must’ lead to a

certain outcome. Those who have such procedures think they must be in the right, even when the outcome ought to compel them to the opposite conclusion. Once they are committed to their theory of how things work, drawing attention to its glaringly obvious failure in the real world leads not to a flicker of doubt, but to a rise in confidence and redoubled efforts along the same line.¹³

Once more the *I Ching* offers insight:

The person who ... keeps on striving when the maximum of influence has already been achieved, knowing only how to press forward and not how to retreat, isolates himself from the human sphere and loses his success. For what is complete cannot endure, and what is pushed to the limit ends in misfortune. Thus the last line says, 'Arrogant dragon will have cause to repent'.¹⁴

Although our current public discourse often implies the opposite, nothing is ever simply yes or no, but always a matter of degree: 'yes, but'. Or, in another Zen saying I love: 'not always so'. Carved into the stone of the ancient temple of Apollo at Delphi, along with the injunction to 'know thyself', was the epitome of wisdom: *mēden agan*, 'nothing in excess'. (I didn't fully understand that in my teens; I do now.) Any principle that is extended too far, without respect to the opposite that is always inherent in it, may turn into the very thing that is being avoided and denied: its dark side. This is especially the case if there is no civilised dialogue between opposing camps. One extreme will simply flip into the other.

Moreover, bureaucracy is an unwitting accomplice in generating extremism. The answer to every ill now is to appoint, often at public expense, an officer, and an office, whose job is to see only one side of a question. Once appointed, these 'tsars' and their tsardoms will not do themselves out of a job by saying, at any point whatever, there is little to be done, since a balance has now been achieved. They will press on regardless, and without any obvious end in sight, finding ever more minute infractions of their principles to deal with by means of further regulation: a hugely wasteful and destructive process, leading to the incubation of resentment. And nobody dares wind them up, for fear of giving the 'wrong message'.

Disregard for the future is matched by disregard for the past and its hard-won wisdoms. ‘No self is of itself alone’, wrote Schrödinger: ‘The “I” is chained to ancestry by many factors ... This is not mere allegory, but an eternal memory.’¹⁵ Because we are part of a living whole in time and space, we have responsibilities to our ancestors, to one another now, and to future generations, something that what we call ‘simple’ peoples and ‘simple’ cultures have always known and taken into account. Ironically, with globalisation, the world has become contracted in space and time to the infinitely thin slice which represents just ‘me’, here and now.

A society is not derived from an assemblage of individuals, but individuals derive from the organism that is a society. ‘The individual actually grows’, wrote the social philosopher Norbert Elias, ‘from a network of people existing before him into a network that he helps to form: the individual person is not a beginning and his relations to other people have no beginnings.’ And he compares it to a conversation where ‘the questions of one evoke the answers of the other and vice versa’, something that ‘can be understood – like the figure of a thread in a net – only from the totality of the network’.¹⁶ For this reason, as Viktor Frankl observed, ‘individuality can only be valuable when it is not individuality for its own sake, but individuality for the human community.’¹⁷ Social understanding, empathy, connectedness, being concerned more with duties than rights, seeing the need for self-discipline, not self-indulgence – all this the reader will know is also far better understood by the right hemisphere than the left.

Is it not the case, though, it may be objected, that technology, the left hemisphere’s extension of its power, is helping to bring one world together? ‘Poisonous nonsense.’ That was the answer given by Waldo Frank, an American historian of mixed race, in an essay called ‘The central problem of modern Man’, published in 1946. Pointing to air travel, television and radio as the media of such supposed ‘one-worlding’, he noted, with remarkable foresight, that with them

come voices, visions, wills, that are products of, and spokesmen for, disintegration; come special and sectional pulls; come egoisms both individual and collective ... the crowded, noisy ignorance of the modern world is less easily invaded by knowledge than was the silence of illiterate epochs. But the peril is more positive ... Each faction of the unassembled body of integration, each with a part of

truth but standing alone, asserting itself alone, multiplies disintegration; causes a pendulum swing from one partial extreme to another.

One wonders what he would say if alive today. But to me what makes his comment so astute is the comparison he makes. Unlike a single cell, or an organism (as the reader of Chapter 12 will remember vividly), to which a society is often compared, we lack any distinct sense of an overall form, or *Gestalt*. So he continues:

... the reason is, of course, the want of pre-existent balance, the organism's way of digesting all it absorbs, using and rejecting according to its *form*. We thus find ourselves in a vicious circle: because we lack the organic sense to begin with, we misuse or deform the trends in our world that should move us toward it.¹⁸

Those who have accompanied me on the trip so far will recognise in North American native myths, ancient Judaic wisdom and Chinese philosophical literature analogies to the myth enshrined in the title of *The Master and his Emissary*. Versions of this insight into the over-reaching nature of mere left hemisphere 'intellect' exist, in fact, in many cultures. (I put the word intellect in inverted commas because, as the reader will know, intellect must not be confused with intelligence, which it often lacks.) The insight is present in Rumi;¹⁹ it is present in the Jewish legend of the *Golem*; and versions are also found in Sanskrit literature including the *Mahabharata*. All of these, including *The Secret of the Golden Flower*, were unknown to me when I wrote that book. Yet these ancient insights were exactly where neurological research has led me.

Nor are these 'merely' ancient insights. Here is the neuropsychologist Stuart Dimond speaking: 'Language immediately makes a claim for itself to be a *prince* among the mental processes, and to be the exclusive medium of mental function, denying often by its existence the presence of other modes of thought.'²⁰ As David Bohm also saw, our conscious thought processes are not, as they proclaim themselves to be, neutral, but motivated by the values, such as they are, of the left hemisphere:

One of the obvious things wrong with thought is *fragmentation*. Thought is breaking things up into bits which should not be broken up ... and at the same time we are trying to establish unity where there isn't any [through categorisation] ... Thus we have false division and false unification. Thought is always doing a great deal, but it tends to say that it hasn't done anything, that it is just telling you the way things are ... that 'you' are inside there, deciding what to do with the information. But I want to say that you don't decide what to do with the information. The information takes over. *It runs you*. Thought runs you. Thought, however, gives the false information that you are running it, that you are the one who controls thought, whereas actually thought is the one which controls each one of us. Until thought is understood – better yet, more than understood, *perceived* – it will actually control us; but it will create the impression that it is our servant, that it is just doing what we want it to do.²¹

Making 'thought' perceivable to our thinking has been one major aim of this book.

Bohm carries on to say that 'thought is creating divisions out of itself and then saying that they are there naturally ... thought divides itself from feeling and from the body.' Once again he unwittingly describes the left hemisphere, cut off from emotion, the body, and all other forms of knowledge; not seeing what it is it cannot see; power-hungry, and seductive as the serpent with its air of innocence offering fruit from the tree of 'knowledge'.²² But his astonishingly clear insight is that, as I too believe, we are in the grip of something bigger than us that tells us it has our interests at heart in order the better to control us. And it has been devastatingly successful. As the theory of complex systems shows, within such a system, while every single part has its effect on the whole, no single part can determine, or necessarily influence, or even perceive, where the whole is nonetheless tending.

In 1922, Rilke wrote in one of his *Sonnets to Orpheus*:

When the machine presumes to inhabit our minds, rather than be at our command, it threatens everything we have achieved. That the

lovelier hesitancy of the master's hand may be no longer manifest, it cuts the stone for its more resolute work to an unyielding line. It tarries nowhere, so that we might escape from it, just for once – and leave it be, oiling away in some quiet factory. It is life – it thinks it knows best, as it orders and makes and destroys with the same determination.²³

This sounds a lot like Bohm's 'thought' that thinks it knows best, pretends to serve, but is quietly in control: and indeed that 'the machine presumes to inhabit our minds, rather than be at our command' is a perfect description of the left hemisphere usurping the right. What Rilke's poem as a whole makes clear is that 'the machine' is a drive, not just a thing: a drive that is implacably opposed to the human, and (as the rest of the poem declares) to all that is vulnerable, beautiful, subtle, holy or awe-inspiring. It destroys. And as before, in the very act of giving up our freedom, we imagine we are the ones that are in control.

Analysis has the capacity to take to pieces (literally, from Greek ἀναλύειν, to 'undo', 'break up' or 'dissolve') what already exists: but, like Flint in the Iroquois legend, it is impotent to bring things into being on its own. I earlier quoted Jan Zwicky on the analytic process: 'Carried too far too often, we lose the sense that something is amiss when the patient exhibits no life. We come to take pride in our cases of polished bone.' Life or vitality comes to us from the body and the unconscious, not from the exercise of analytic reason; much as the gardener does not *make* the plants, or *make* them grow, but merely trims and tends the natural vigour that comes from elsewhere – in this case out of the earth and the seed. D.H. Lawrence referred to 'the true unconscious, where our *life* bubbles up in us, prior to any mentality';²⁴ and elsewhere, in speaking of his embodied existence, whether sick or well, 'I am alive, alive to the depths of my soul, and in touch somewhere with the vivid life of the cosmos'.²⁵ It is hard to feel alive when you have done everything possible to deny the existence of your embodiment, as man or woman – which is flesh and blood, not merely dry bones, however well-polished.

And then we will die, of course; but does that necessarily mean we were ever really alive? It seems to me that, in Kürnberger's phrase, life itself no longer lives. We are, more than anything else, *devitalised*: another

predictable consequence of left hemisphere domination. Mechanism has triumphed over organism.

Because of our lack of sense of the cohesion of a dynamic whole, we end up acting in bad faith. Not for the first time, it is Erwin Chargaff who puts it most vividly:

Our time is cursed with the necessity for feeble men, masquerading as experts, to make enormously far-reaching decisions ... You can stop splitting the atom; you can stop visiting the moon; you can stop using aerosols; you may even decide not to kill entire populations by the use of a few bombs. But you cannot recall a new form of life ... The world is given to us on loan. We come and we go; and after a time we leave earth and air and water to others who come after us. My generation, or perhaps the one preceding mine, has been the first to engage, under the leadership of the exact sciences, in a destructive colonial warfare against nature. The future will curse us for it.²⁶

In the second half of *The Master and his Emissary* I aimed to show how we have succumbed twice in the West (at the end of the Greek and Roman civilisations) and are now succumbing for the third time, to the temptation to see the world only through the eyes of the left hemisphere emissary. In the past this has coincided with the over-reaching of an empire, as today, and the collapse of a civilisation, as I fear awaits us tomorrow. But never has the hold of the left hemisphere on us been more complete than it is today. Its form of attention to the world and way of being in it confront us wherever we look. The sword must be turned around if we are to survive.

THE PURSUIT OF HAPPINESS

Let me ask one simple question. Has our weird inversion of values made us happier?

We are the world's most relentless ever seekers after hedonic happiness: pursuing personal pleasure. This only succeeds in setting us on 'the hedonic treadmill', whose results are a restless, endless yearning for more of something we know not what, a craving that can never be fulfilled. Eudaimonic happiness, by contrast, is the result of leading a more 'other-centred', rather than self-centred life, of self-restraint – in short, living unostentatiously what has traditionally been called a virtuous life; it gives rise to a sense of fulfilment and vitality. By contrast with hedonic happiness, it protects against depression, and lowers all-cause mortality: it is also more dependent on the right hemisphere.²⁷

The pursuit of hedonic happiness depends upon a set of values that our society has taken to be axiomatically superior. These are the values of individualism: personal autonomy, control, choice. But the evidence is that they do not provide a pathway to a happy life – rather the reverse. In fact at the heart of all this is what has come to be known as the 'vulnerability paradox'. Cultures can be characterised by four main measures, according to the most widely adopted criteria in cross-cultural psychology, those of Geert Hofstede: greater or lesser inequalities of power, greater or lesser autonomy, more or less structured codes of behaviour, and more or less fluid roles for men and women.²⁸ To these he later added measures of longer-term (self-denying) or shorter-term (self-gratifying) orientation. The seeming paradox lies in the fact that countries that score 'best' (as the prevailing climate of opinion would see it) in terms of these factors – that is to say societies with lower power inequalities, greater autonomy, less structured codes of behaviour, and 'low masculinity' – have higher rates of mental illness and suicide. That such an outcome should be labelled 'paradoxical' by professional psychologists is a measure of just how unquestioning has become our commitment to values which do in fact turn out to cause harm: if we were not so blindly committed to them, there would be no paradox, simply the observation that the values that underpin

the pursuit of hedonic happiness result in higher rates of mental illness and suicide.

Satisfaction and happiness ratings in all modern societies that have been researched have declined as they have become more prosperous and more ‘Westernised’.²⁹ (The decline has been particularly steep among women: over the 35 years between 1970 and 2005 women’s happiness declined both absolutely and relative to men.³⁰) The suicide prevalence in lower-income countries is lower than in higher-income groups, and in modernised societies higher than in traditional societies. In Britain, while suicide rates have always been and remain higher for men (roughly three times those for women), the rate of increase in suicide is steepest in young women between 10 and 24 years of age.³¹ This is in line with findings in other Western countries.³²

Psychologist Jean Twenge studied rates of psychopathology in adolescents, relying on serial contemporaneous assessments using the same objective assessment tool and meeting stringent standards, over the period from 1938 to 2007. By these means she avoided the problems of retrospective accounts, of changing diagnostic fashions and of new patterns in willingness to seek help. She found that there were between five and eight *times* as many students that met a common cut-off for psychopathology in the latest cohort compared with the earliest, and this may be an underestimate because many recent subjects were already stabilised on an antidepressant, a possibility that did not exist for the earliest cohorts.³³

A major 2018 survey, which charts social isolation using a common measure known as the UCLA Loneliness Scale, shows, according to Arthur Brooks, that

loneliness is worse in each successive generation. In the ‘siloes’, or isolated, worlds of cable television, ideological punditry, campus politics and social media, people find a sense of community in the polarized tribes forming on the left and the right in America. Essentially, people locate their sense of ‘us’ through the contempt peddled about ‘them’ on the other side of the political spectrum. There is profit to be made here. The ‘outrage industrial complex’ is what I call the industries that accumulate wealth and power by

providing this simulacrum of community that people crave – but cannot seem to find in real life.³⁴

Findings from the Cigna US Loneliness Index 2018 include: when asked how often they feel like no-one knows them well, more than half of the respondents surveyed said they feel that way always or sometimes; approaching half of respondents felt that their relationships were not meaningful; more than half of adults aged 18–22 identify with 10 of the 11 feelings associated with loneliness.³⁵

There is clear contemporary research evidence that supports the positive correlation between suicide and individualism.³⁶ Durkheim had already observed in the late nineteenth century that the loss of the sense of belonging and having a secure role in a society – what he called *anomie* – and an individualistic casting off of well-defined societal values, norms, and goals – which he called *égoïsme* – are prominent concomitants of suicide.³⁷ Indeed, if you had set out to destroy the happiness and stability of a people, it would have been hard to improve on our current formula: remove yourself as far as possible from the natural world; repudiate the continuity of your culture; believe you are wise enough to do whatever you happen to want and not only get away with it, but have a right to it – and a right to silence those who disagree; minimise the role played by a common body of belief; actively attack and dismantle every social structure as a potential source of oppression; and reject the idea of a transcendent set of values.

And there is a further point to make. Something noticeable has happened to our emotional range, which also illuminates how our values have been corrupted. It strikes me that, as a culture, we are losing the capacity for sorrow. This might sound like a good thing, but is far from being so. Indeed it may even be a sign that we are losing our humanity. Sorrow is a normal part of life, and nothing like anxiety and depression (in which, contrary to popular belief, a capacity for sorrow may be diminished). We have lost that sense of deep connexion and communion, eliciting feelings of longing, tenderness and compassion, and which is more prevalent than any other sense in the musical traditions of the whole world. Music, like great works of tragedy, and like the rites of a religion, acknowledges sorrow and redeems it by taking it up into something with a capacity to heal. In our world, in place of sorrow or sadness, we have anger,

resentment and self-righteous indignation. Sorrow and sadness depend on connexion; anger, resentment and self-righteousness on alienation. Sorrow leads to insight; anger to blindness. As the reader will know a capacity for sorrow is closely connected to a capacity for empathy, and both are heavily dependent on the right hemisphere; whereas anger, like denial, is heavily dependent on the left hemisphere.³⁸ Our public expressions in art, in films, and in the stories and myths we espouse showcase conflict, self-assertion, violence, aggression, torture and horror – or alternatively a sentimental and unremitting positivity – but little in the spectrum of sorrow, or tenderness, certainly when compared with other times and other cultures. This is part of our overvaluing of the rhetoric of power, which often seems to be the only value that gets discussed, whether it be in relation to political values, societal discourse or even the critique of works of art. With it goes a dereliction of the value of what is vulnerable.

Given this rhetoric, it is hard for us to realise quite how much we close the door on when we are too brittle to allow ourselves to remain open to life as it is, not as we imagine it ought to be. In the face of all that we are destroying, we have lost, it seems, the capacity to mourn. Perhaps acknowledging the loss would be, for many of us, simply too painful.

THE INVERSION OF VALUES

I have suggested that values should be considered ontological primitives (ie, irreducible and foundational); that, of course, we may observe and esteem any one value or not, but that we do not manufacture them. Rather we recognise them, respond to them and help them grow – or not; and that in doing so, as in everything, the hemispheres see them differently. Max Scheler thought there was a hierarchy of values, with those of pleasure and utility – the values of utilitarianism and the left hemisphere – at the lowest level, and rising by stages to that of the holy or sacred, which he considered the highest: a value which I suggest is incomprehensible to the left hemisphere. In between were, first, the *Lebenswerte* or values of ‘life’, such as courage, magnanimity, nobility, humility and loyalty;³⁹ and then the *geistige Werte*, the values of mind or spirit, such as beauty, goodness and truth – which I have suggested are better understood by the right hemisphere. In the world we live in, the reductionist narrative is that holiness is a deceit employed by clergy to maintain power and privilege; that beauty is a tool of sexual selection; goodness and truth tools of social cohesion; the *Lebenswerte* merely opportunities for simple-minded individuals to indulge in self-sacrifice for the benefit of the group; and that all that really matters is pleasure and utility – the only values that do not require affective or moral engagement with the world. In other words, in a thoroughly cynical assessment of what it means to be human, we have inverted Scheler’s hierarchy and exalted the individual ego. Instead of his *ens amans* we have *homo economicus*. This inversion is just as predicted from a culture marked by left hemisphere dominance. And it has rendered many virtues, including, but not confined to, beauty, goodness and truth, fugitive species.

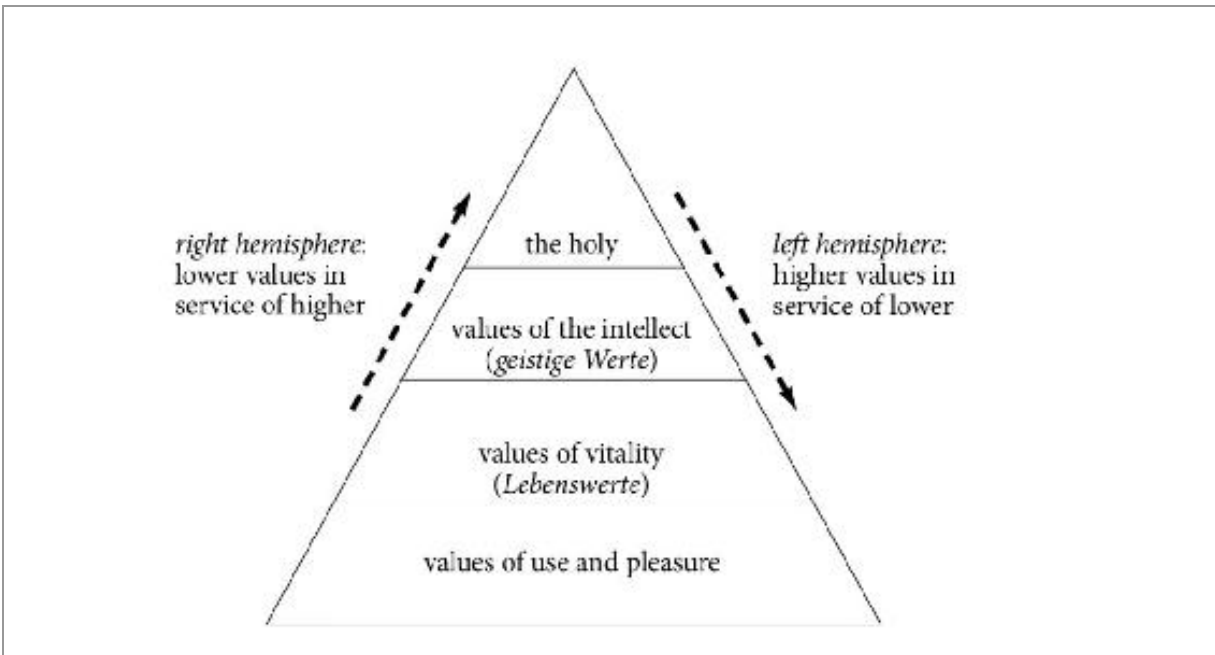


Fig. 62. Pyramid of values according to Scheler

The left hemisphere's *raison d'être* being power and control, it naturally puts values of utility and hedonism, those of the lowest rank in Scheler's pyramid, first. I may be wrong, but it is my distinct impression that there has been a decline in courage, loyalty and humility in our society – indeed in all behaviour that carries its costs upfront, rather than concealing its sting in the tail; speaking the truth takes courage, and it would seem that those in the institutions of government, science and the universities would rather conform than confront untruth. The powerhouses of intellect, the universities, have lost their nerve, and become passive, conformist and feeble – and excessively bureaucratic. Perhaps because of this I can't help noticing that many of the most interesting ideas in science, in politics and in philosophy these days come from outside the institutions – something I say only with the greatest of regret, as someone who always saw himself as a proud beneficiary of their ancient traditions, and who wished to further those traditions. And along with the loss of courage to speak the truth, there has been an undeniable withdrawal from the beautiful and the sacred. All of this combines to reinforce a loss of sense of purpose and direction – or 'the faintest idea of what we are doing', in Walker Percy's phrase. Hence the crisis of meaning that it is, by now, a commonplace that we face.

Considered just from the left hemisphere's narrowly utilitarian point of view, its blind destruction of the three elements that are most important in securing our well-being – closeness to the natural world, social cohesion and embrace of the divine – is self-defeating. That these elements are so vital to well-being is not my opinion, but as near a fact as we can get. I deal with the evidence regarding the extraordinary range of beneficial effects on health, both physical and mental, and on resilience, happiness and fulfilment, associated with religious belief and observance in Appendix 8. I dealt with the similar evidence regarding social cohesion in *The Master and his Emissary*.⁴⁰ But there is equally impressive evidence attaching to the effects of our being close to Nature. A multitude of studies testify that spending time in Nature is conducive to improved physical and mental health on a wide range of indicators, to a sense of well-being and happiness, and to improved attention, cognition and social functioning; while deprivation can lead to the opposite, including anxiety, anger, and frustration, problems with attention and cognition, and the psychological and physical concomitants of stress.⁴¹ The irony is that these three aspects of life, which can be fully appreciated only by transcending the narrowly utilitarian view, nonetheless ought, on purely rational grounds, to be embraced even by those whose values go no further than the wholly utilitarian. The *non*-utilitarian value of religious observance, social cohesion and closeness to Nature would have seemed a foregone conclusion in any other culture than our own: and now we know the utilitarian value is also overwhelming. Are we, suddenly, so 'Bright' after all?

In summary, two things stand out. The first is that, although we are inextricably part of it, derive our whole existence from it, and are ourselves incomprehensible when sundered from it, we have abandoned Nature. Nature – not some abstract, eviscerated, bureaucratic entity known as 'the environment', which exists to be managed and exploited; not some technical set of mechanisms called an ecosystem; but Nature, whose meaning is that-which-is-about-to-be-born, and is feminine – and what's more a goddess; Nature, that, like Kali, is wild, and gives life and destroys – or rather does not destroy, but transforms one being into another; ⁴² Nature, that is our mother and our healer and our home, as well as our ultimate fate; Nature, that we are reviling and doing our best to devastate – is the great whole to which we belong. All the elements of the left

hemisphere insurrection can, individually and together, be seen as an attack on Nature – and, with it, on the body; and hence on life itself.

‘Let us allow Nature to play her part’, wrote Montaigne, sceptic that he was: ‘she understands her business better than we do.’⁴³ Nowadays we are sceptical about Nature, because too often she refuses to behave according to our new rules. But scepticism of one position merely leads to certainty about another unless scepticism is equally applied to its opposite; total scepticism of both leaves us impotent; a vestige of scepticism about scepticism re-engages us with a possible balanced solution.

The other thing that stands out is that we have abandoned even the pretence of seeking wisdom, instead intent on seeking power. Wisdom and humour are both expressions arising from the shared suffering involved in acquiring one of the greatest flowers of life, a sense of proportion. They are both important elements in turning us away from aggression and towards healing. But, for us now, humour is dying along with wisdom: the left hemisphere Puritans are seeing to that. Puritanism always was the enemy of *both*; and it has historically often been associated with aggression, destruction and a ferocious need to control – with power, in other words, above all else.

A member of the Swiss Parliament, Lukas Fierz, recalls as a boy meeting his celebrated neighbour, Carl Gustav Jung. In the course of conversation,

Jung told us about his encounter with a Pueblo chief whose name was ‘Mountain Lake’. This chief told him, that the white man was doomed. When asked why, the chief took both hands before his eyes and – Jung imitating the gesture – moved the outstretched index fingers convergingly towards one point before him, saying ‘because the white man looks at only one point, excluding all other aspects’.

Many years later, Dr Fierz, who is a physician and a founding member of the Green Party in Switzerland, recalls that a significant adversary of that movement was a successful industrialist and self-made billionaire:

I asked him what in his view was the reason for his incredible entrepreneurial and political success. He took both hands before his

eyes and moved the outstretched index fingers convergingly towards one point before him, saying 'because I am able to concentrate on only one point, excluding all other aspects'. I remember that I had to swallow hard two or three times, so as not to say anything ...⁴⁴

The secret of success – of a kind; and the formula for ruin.

SO WHAT SHOULD WE DO?

I am convinced that it will do little good to tackle these problems piecemeal, while essentially retaining the mindset that caused them to arise in the first place. Of course at some stage the piecemeal method is necessary, even vital – the left hemisphere, in other words, acting properly as the useful servant, not the master. But such efforts are of no avail unless they form part of a greater project that involves radically revising our whole concept of the reality of which we are a part, and of who we are within it. Only then do we stand a chance of being possessed of a different set of values and of changing our behaviour accordingly. Without deep-rootedness and appropriate soil a tree will not stand. So, if we want to ‘tackle climate change’ we most certainly do have to take whatever steps are necessary to stop destroying the rain forests. But if we go on thinking of the extraordinary richness and beauty of abundant life in them merely in terms of what it can do for us, what it is ‘worth’ to us in terms of utility, which ultimately translates as economic value, we might as well forget trying to save ourselves, and allow ourselves to sink.

As long ago as 1805 Schelling already saw the root of our malaise. There is no higher realisation in all of science, he believed (and he was well versed in the physics and chemistry of his time) and none higher in art, philosophy, or religion, than that of the sacredness of what, for want of language, he refers to as the ‘All’; and that in those ages where we are mindful of this unity, a culture enjoys vigour, and vitality, and the fruits of the collaboration of the arts and sciences. But

whenever the light of that revelation faded, and men came to see things not in relation to the All, but as distinct from one another – not in their unity, but in their disjunction – and in the same spirit came to conceive themselves as in isolation and estrangement from the All; then one sees science, lost in the desert expanses, struggling to take meagre steps in the furtherance of knowledge, grain of sand by grain of sand, so as to put the universe together. And with it one sees the beauty of life vanish; and the spread of a savage war of

opinion over the most essential and important things, while everything falls apart in a mass of details.⁴⁵

Like Schelling, I believe that without an overarching understanding of the ‘All’ of which we are a part, however tentative and incomplete it must necessarily be, we are bound to go on acting in such a way that we lose everything we value – or all that, when in our right minds, we value. The left hemisphere has dismantled the universe and is unable to put it back together again. Without a radically different understanding we just can’t carry on. That is why I have written this book.

Behind my attempt to offer a truer account of the reality in which we belong, there lie three fundamental questions.

The first of these is: ‘In our explorations of reality, how can we know what to trust – that is to say, to believe to be true of it – at least in the sense of truer than any of the alternatives?’ Addressing that was the burden, in different respects, of Parts I and II of the book, and my answer was given at length in those pages.

The second was this: ‘What account of reality then emerges?’ That was the burden of Part III. There I attempted to provide an account of what Schelling calls the ‘All’ that is richer and truer than the narrowly left hemisphere account which has been our lodestar for the last three hundred years or more, and which has brought us to this pass. It is in no sense a new account. Readers of the book will be well aware of the debt it owes to the wisdom of ancient myths and to the insights of philosophers over the centuries, many of whom have occupied a dissident place on the fringes of the dominant culture. What I hope I have done, however, is to bring fresh support to their insights from what the hemisphere hypothesis tells us – and, incidentally, from what recent, exciting, developments in the philosophy of both biology and physics are confirming. The hemisphere hypothesis demonstrates very clearly, I believe, that the prevailing account of the ‘All’ is the product of an unbalanced, untempered and characteristically domineering, go-it-alone left hemisphere view of the world, one that is false, impoverished and dangerous; and that a form of attention to the world that allows into the picture what the right hemisphere discerns produces a truer, richer account of the ‘All’, without which we shall perish.

The world, I suggest, is far different from the way it has been generally understood – with notable, mainly disregarded, exceptions – over Western

history, certainly recent history. It is a world in which relationships are ontologically primary, foundational; and ‘things’ a secondary, emergent property of relationships. It is one where matter is an aspect of consciousness, not consciousness an emanation from matter. It is one in which there is a natural process of individuation, but one the aim of which, far from disrupting wholeness, is to enrich it. It is one where opposites are not as far as possible removed from one another but tend to coincide. Change and motion are the universal norm, without disrupting stability and duration. It is one where nothing is wholly determined, though there are constraints, and nothing is wholly random, though chance plays an important creative role. Indeed the whole cosmos is creative; it drives towards the realisation of an infinite potential. It is one to which we are profoundly connected – out of which we arise and to which we again revert; Nature being our specific home in that cosmos from which we come and to which in time we return. It is one that absolutely cannot be properly understood or appreciated without imagination and intuition, as well as reason and science: each plays a *vital*ly important role. It is neither purposeless nor unintelligent, but simply beyond our full comprehension, though we are given enough insight to kindle wonder and awe, and the impetus to try to understand what little we can. It is an expression of energy and form, form within energy and energy within form, each both ‘challenging’ and ‘liberating’ the other to further creative realisation. It’s more a dance than an equation. And at the core is something we call the divine, which is itself forever coming into being along with the world that it forms, and by which, in turn, it too is formed.

And now: the third question, which follows from this, since we are part of the All: ‘We, then – who *are* we?’

On what grounds I base my answer to this last question, only the reader of this book will understand; but what I say is this.

Ultimately of course we cannot really know fully who we are. But we can know what we are not. We are definitely not the lonely, isolated, predatory egos we have been taught to think of ourselves as being; hurled into an alien universe, mere accidents of cosmic history, whose lives, like the cosmos itself, are pitifully devoid of meaning, purpose and value. We are not the playthings of necessity. Nor in our dealings with Nature are we merely detached observers, manipulative, tinpot gods – in our dealings with one another forever doomed to fight with and destroy one another. Power

and pleasure are not our only values, nor by any means our greatest values, nor do they on their own satisfy us, add beauty and goodness to existence, or help save us from ourselves. The boxes into which we force reality are a mental expedient, since no two things and no two people are ever really the same in any quality whatsoever, except the fact of their existence. This is central, because all is, once it is properly seen, unique; and it is the business of living to unfold that unending potential for uniqueness. At the same time nothing and no-one is ever wholly disconnected from anything else: the uniqueness is not in any way opposed to that connectedness, but vitally dependent on it, and in turn *constitutive* of it.

We are temporarily material entities, capable, we do not know how or why, not just of awe before creation, but of playing a part in creation itself; beings that emerge out of the original consciousness, eddies in a seamless flow that embraces everything that is and was and will be; for a while distinct, but never wholly separate from the flow, since we *are* for a while that flow, wherever it finds itself. We are embedded in the cosmos that gives rise to us: the least that can logically be said is that there is something about this cosmos that makes it such that we and all our capabilities, all our achievements and creations, for good or ill, can arise. They simply cannot come from anywhere other than the cosmos in which we belong. What is wonderful about us is not our pitiful lust for power, our self-absorption and our armour-plated invulnerability, but precisely our capacity to be vulnerable, to wonder, and to love: which alone makes what we most value possible.

This is all very well, someone might say, but it is a myth. That is of course true, but it doesn't deliver the hoped-for, knock-out blow. Just as there is no option to think without metaphor, there is no such thing as not having a myth: those who think they don't have a myth have merely bought into the prevailing myth of the time – in our case, the myth of the machine – so thoroughly that they are not even aware of it. Our only option is to espouse a worse or, one hopes, a better myth. As the reader will know, I have argued that myths, like metaphors, are by no means lies that are *invented*, but aspects of truth that are *discovered*, and form an inevitable, indeed crucial, part of the search for that truth. Myths oversee – or underwrite – what we are capable of seeing. The nature of the attention that we bring to bear on the world, and the values which we bring to the encounter, change what we find; and in some absolutely non-trivial sense,

change what it is. At the same time, the encounter, as is always the way with encounters, changes who we are. Thus in addressing the question ‘who are we?’, the attention we pay and the values we hold both contribute to the answer which we receive.

The aim of this book has been to address the issue of values by, first, attempting to provide a truer account of the reality we inhabit and, then, of our identity within it. The answers, such as they are, that have emerged cannot be stated simply – a fact which explains what the reader may feel has been the inordinate length of the book. But the experience of readers of *The Master and his Emissary*, as they have reported and continue to report it to me, encourages me to believe that changing the whole way in which we see our lives, our experience, our world, can be achieved by such means.

The account we give of ourselves helps determine our values, and hence our behaviour: and, since how we behave is central to whether we could ever save ourselves and our world from the current tragic state of affairs, all this matters profoundly. We need the best myth we can have. I offer a myth that I believe, if lived, will be found truer than the reductionist one peddled in the market place. One that promotes much needed healing, not further destruction. That is all. But on that ‘all’ everything depends.

Remember Thoreau’s words: it’s not what you look at that matters, it’s what you see. We need to bring ourselves to see a new *Gestalt*, one in which what seem like fragments of knowledge form part of a coherent whole. This book has covered a lot of ground; that was inevitable if I was to show that there are deep accords between patterns of phenomena arising in what are conventionally thought of as widely disparate areas of knowledge – neurology, philosophy, physics: a consilience (literally, ‘a jumping together’), to use a fashionable word, that is together more revealing than its constituents could ever be apart. In reality they are never wholly separable. But I want to emphasise again: it is not just a matter of putting together ever more facts, but of developing an understanding. Neurology *matters*. It is not just a technical exercise in electronics, whereby we discover more data about the ‘circuitry’. It means absolutely nothing, unless it helps us better understand human minds and lives: who *we are*. Philosophy *matters*. It is not just a procedural business of logic-chopping and point-scoring. It means absolutely nothing, unless it helps us to a wiser view of human experience and the nature of human being. Physics *matters*. It is not just a tool for manipulating the world, but for understanding it. All

three help answer the questions of what the world is and who we are, on which all else depends.



It will not surprise the reader that I have spent much time in the company of Roger Sperry, though I was never lucky enough to meet him. Like me he started out in the humanities, and of course he went on to be the person who most deeply investigated the significance of the bipartite human brain. Sperry was not merely a neuroscientist but a philosopher of considerable discernment, many of whose insights came from the research into hemisphere difference which won him the Nobel Prize. Reflecting on the ills of Western society nearly half a century ago, he wrote that ‘what it comes down to is that modern society discriminates against the right hemisphere.’⁴⁶ He later amplified this observation:

By evolutionary time standards, the fate of life on our planet has suddenly, and quite abruptly, come to rest on an entirely new form of security and control, based on the machinery of the human brain. The older, noncognitive controls of nature that have regulated events in our biosphere for hundreds of millions of years, the forces of nature that lifted life from the amoeboid to the human level and created man, are no longer in command. Modern man has intervened and now superimposes on nature his own cognitive brand of global domination...

Any attempt to attack directly the overt symptoms of our global condition – pollution, poverty, aggression, overpopulation, and so on – can hardly succeed until the requisite changes are first achieved in the underlying human values involved. Once the subjective value factor has been adjusted, corrections will follow readily in the more concrete features of the system ... Among the vast complex of forces that influence and control the brain and behaviour of man, the factor of human values stands out as a universal determinant of all human decisions and actions ...⁴⁷

This book is my best attempt to address Sperry's concern and to suggest how 'the factor of human values' he sees as all-determining might be shifted from its current, catastrophic, condition.

Let me be clear: replacing the right hemisphere in its proper position, one in which the left hemisphere works with it, but serves it, rather than aims to control it, is not to wish for some dream of softness, lack of rigour and ease. Quite the opposite. This is not an easy path. It makes demands on us, far more than the selfish, complacent vision of the left hemisphere has ever done: which just adds to the reasons we don't want to change. As the reader has seen, the right hemisphere has more of a grasp of moral values, is apt to take responsibility rather than blame others, is more apt to inhibit our first impulse to what is simple and easy, is more intelligent, and complicates our simple mechanistic vision by its insight. And for the umpteenth time, as the reader of this book knows, we do *not* achieve any of this by turning our backs on reason and on science. As I have explained, the right hemisphere makes the most valuable contribution to both. If anything reason and science are worryingly diminished in our world: reason, by its narrowness, become unreasonable; science, by its narrowness, unscientific. Both have become tarnished by dogma. We should expect not less, but more and better of both; it is dogma we must avoid at all costs. Dogma is the besetting sin of the age; and if one wanted one it would be hard to find a better expression of the left hemisphere's take on the world than dogma.

Towards the end of his life Einstein was asked if he had any regrets. Reportedly he replied: 'I wish I had read more of the mystics earlier in my life.'⁴⁸ I have been forcibly struck by the remarkable similarities in the wisdom enshrined in writings coming out of a breadth of traditions – Hindu, Taoist, Buddhist, Christian, Hebrew, Islamic, those of the ancient cultures of North America, or those of ancient Greece – that I have encountered; and I would be surprised, on that basis, if there were not a great number more, not just texts but whole traditions, of which I remain wholly ignorant, that could be added to such a body of wisdom.

Scheler wrote that 'every finite spirit believes either in a God or in an idol.'⁴⁹ Having abandoned God, our idol is – *ourselves*, as 'God': the gaining of human power over every manifestation of Nature, so as to subdue it in the furtherance of a plan that came to us, viewed from a historical perspective, barely minutes ago, and which we have therefore had no opportunity properly to evaluate, and whose outcome is fully unknown,

although we can already see the most ominous signs that mean we can't possibly go on living the way we do now. 'Nothing is more useful than power, nothing more frightful', wrote Heschel. 'We have often suffered from degradation by poverty, now we are threatened with degradation through power.'⁵⁰

Despite being deeply suspicious of a great deal of 'God talk' myself, and while fully acknowledging the problematic nature of the very word *God*, I feel our repudiation of God is not a wise move. It is easy to misunderstand what cultures wiser than ours were trying to express by speaking of God; still easier to reject the idea of God entirely. But easy is not enough. It is our duty to do the more difficult thing: to find out the core of wisdom in this ill-understood, though universal, insight, for that there is such an inestimably valuable core seems to me more credible than anything else I know.

I have said what I can. If you wish more, I can do no better than repeat the words of the seventeenth-century priest and physician, Angelus Silesius:

*Friend, that is surely enough. And should you want to read
more,
Then go and become yourself the words, and yourself the
Being.*⁵¹

APPENDIX 4

WHAT HAPPENS TO TIME IN DEPRESSION

This evidence should not be read in isolation from its context in the overall argument of Chapter 22.

As with schizophrenia, the whole range of existential changes encountered in depression can also be conceived in terms of a disturbance of time.¹ And that means equally in terms of the body, since the one affects the other. For example, when I am absorbed in the flow of experience, enjoying what I am doing, my body is in the background, as that *through which* I experience the world – it is the lived body, *der Leib*; and time, too, is in the background, that *in which* I live, think and act intuitively. They do not obtrude, as things, objects of experience – that is to say, not subject to the Gorgon stare of the left hemisphere.

When, by contrast, I am outside the flow of experience – because, for example, I am bored, stressed or in pain – my body is foregrounded, and becomes focussed on as a *thing* in the world, *ein Körper*; and time, too, becomes my focus, some *thing* I observe anxiously from the outside, constantly looking at my watch, only too aware of something I call ‘lateness’.² This change in the nature of attention changes the experience of time and the body.

In our ordinary experience of time, past, present and future are entirely seamlessly connected. In our awareness there are, at one and the same time, yesterday’s pleasure or pains, and tomorrow’s hopes or fears, inextricably bound up with one another, as each note of a tune inevitably brings with it its relation to those parts of the tune that are technically past (no longer detectable by a recording device, but crucially alive to the mind) and those

that are to come (which the mind inevitably anticipates). The philosopher Matthew Ratcliffe writes:

Even if you haven't heard [a melody] before, there is a sense of roughly what will come next, as illustrated by the surprise you feel when a note is out of tune. This expectation also shapes how a present note is experienced. Notes that have just passed are experienced in the present but *as* having passed, and *as* that out of which the present has arisen.³

More importantly, no part of the melody makes any sense or exhibits any power on its own. It works as a whole or not at all. This process of fulfilment and anticipation is dynamic: as certain possibilities are actualised, others appear. It is inseparable from the experienced 'flow' of time.

Though the experience of time in schizophrenia and depression may seem superficially similar – for example, in both it may be experienced as slowed down – I believe the two are distinct. As one might expect for a right hemisphere-dominant condition, depressives are able to judge time duration accurately when specifically tasked to do so – in fact, they are actually better than normals.⁴ This may be part of a generally greater realism in depression. However, personal time is another matter. The sense of time passing is slowed down for depressive subjects by contrast with the time everyone else is living – of which, unlike in schizophrenia, the subject is only too aware.⁵

In schizophrenia both body and time have become insubstantial, airy, unreal, virtually non-existent. The overall feel of the schizophrenic world has been aptly described as 'peculiarly insubstantial, evanescent, and hovering'.⁶ In depression, by contrast, time and the body become oppressively real: more substantial, heavier and darker than usual.

To the depressive patient the body is hardly insubstantial: it is heavy, solid, sluggish, but very real. Its functioning appears to slow down (and literally does so, including the autonomic functioning of, for example, the bowels), but the body remains an ever-present focus of concern, not something from which the patient has become alien. Quite the reverse: it is the very sense of bodily effort, the lack of energy, motivation and drive, that

make action so difficult; it is the feeling of ‘going nowhere’ which ensures that the body is all too present. As Sass observes, ‘whereas the person with schizophrenia feels *detached* from his body, the melancholic feels somehow over-identified with it.’ ⁷ With remarkable insight Shakespeare makes the melancholic Hamlet complain:

O that this too too solid flesh would melt,
Thaw, and resolve itself into a dew!

For the depressive subject, the lived body is inescapable, yet lacks its usual grace to move in accordance with the flow of the world; whereas, for the schizophrenic subject, the lived body has simply evanesced, and one is left with a somewhat bizarre scientific exhibit.

Images of ‘being weighed down’ and ‘being in a state of darkness’ are the two most familiar metaphors produced in depression.⁸ Many melancholics describe an actual sense of pressure on the body, particularly around the area of the heart (‘heavy heart’); and similarly in depression colour is literally experienced as darker – in particular, as greyer and bluer, the recovery from depression being accompanied by a sense of the return of the vividness of colour and light.⁹ (Goethe observed that blue is ‘on the negative side’, noted its ‘affinity with black’, and remarked that ‘the appearance of objects seen through a blue glass is gloomy and melancholy’.)¹⁰

So it is with time. For the schizophrenic subject, time has ceased to have meaning, or even existence; while for the depressive subject, time is ponderous, inescapable and oppressive. It is the *contrast between* the present weight and lethargy of both body and time, and the quickness and lightness of body and time when one is in the flow, that is so overwhelming to the depressed subject. *And time must be present for such a comparison even to take place.* Remember how Zingerle’s right hemisphere stroke patients had no sense of how their bodies or they themselves could ever have been otherwise? Such a comparison is not generally made by the schizophrenic subject, for whom neither body nor time, as normally understood, exist at all. The melancholic is quite able to ‘feel that I cannot feel’; by contrast the schizophrenic can scarcely ‘feel that I cannot feel’.

There is a difference between the almost metaphysical statement of the schizophrenic that there is no longer any future, present or past, and the depressive's saying that 'for me there is no future'; 'my past is all gone'; 'I cannot live in the present'. Behind those statements are implied 'I know that the future exists and other people have a future', 'the past is an oppressive loss', and 'I no longer feel myself to be present as other people do'. In schizophrenia there *is no* time; in depression, there is an all too oppressive time, that has slowed or stopped. Schizophrenics live outside time, and are supremely indifferent to it; whereas depressives are involved with temporality, obsessed with the loss of the past and afraid of what the future will bring. In depression it is not that the future doesn't exist, but that it is hard to imagine one's own future, because one is still frozen in the painful experience of the past, without any possibility of redemptive change. This may be the opposite (as according to the hemisphere theory it should be) in mania, where all is geared towards an unrealistically brilliant future. 'In melancholia, the past becomes more determining, and the future less open; in mania it is the reverse'.¹¹ In depression, time is freighted with minatory meaning, and it is this that stops us moving or becoming: we no longer move, but the world *does* continue to move.

Memory of the past is a *living* process, not a *thing*, and neither fictional nor insubstantial; stored in the body and substantiating who we are from moment to moment. It is not an inert record, like a computer data bank, but part of the flow that constitutes what Merleau-Ponty calls the body-subject. A person with no past and no narrative would be a contradiction in terms: which is why schizophrenic subjects sometimes deny their existence.¹²

Humans being complex, these distinctions between schizophrenia and depression are not absolute and invariable: in particular there are mixed, so-called schizo-affective, conditions, and some chronic schizophrenic subjects would also qualify as depressed. But the distinction is, I think, nonetheless immediately recognisable to anyone working with psychotic patients.¹³

Cutting writes perceptively:

Schizophrenics talk a lot about death, and are prone to delusions which fit the conventional category of nihilistic delusions. But what they mean by 'being dead' is completely different from what depressives mean by this, as is what they mean when they talk about 'nothingness'. The schizophrenic generally intends 'dead' or

‘nothingness’ as *never-alive thingness*; the depressive generally intends these as the *dying of living beings*.¹⁴

This distinction between two superficially similar, but radically different, states goes to the core of the two conditions. In one, the left hemisphere-dominant condition, there never was life, only mechanism; in the other there was all too clearly life, and it is this loss that is lamented. Those who see the life that is being lost, the world that is dying, grieve; others cannot see how we could ever have seen the world and ourselves as anything other than timeless mechanisms.

One distinguishing feature of depression is the excessive willingness to accept responsibility, as in delusional guilt; and a distinguishing feature of schizophrenia is the inability to accept responsibility, as in delusions of control of thoughts, feelings and actions by *others*. It is as though the depressed subject is excessively attuned to community, whereas the schizophrenic is insensitive to community altogether.¹⁵ Hence Bleuler’s designation of ‘autism’ (self-involvement) as a cardinal feature in schizophrenia. This would seem to be a classic left/right difference, since the sense of social connectedness is highly dependent on the right hemisphere, especially a network involving the frontal lobe and the right temporoparietal junction.¹⁶

Connexions to others are burdensome to the depressive subject in numerous ways. The inability to feel for loved ones what one normally feels causes distress and guilt. At the same time the suffering of others is felt more acutely. There is not a lack, but an excess, of empathy. It becomes impossible to take part in the usual social nexus that gives meaning to life, but this is not a matter of indifference: it is a constant source of pain and a sense of falling away from the lived world. Awareness of the effect of one’s own mental state on others adds to the burden. One’s sense of being poisoned seeps into the surroundings and contaminates them, too, with poison. And in some cases subjects feel that they have committed terrible crimes against others, of which they could not possibly be capable. Cutting and colleagues note:¹⁷

The depressive, furthermore, is someone who is more attuned to communal values than the sane, unlike the schizophrenic, who has

lost this facility.¹⁸ This takes the form of a hypersensitivity to the morals of society.¹⁹

In general one might say that in schizophrenia, values tend to be absent, so their fulfilment or otherwise is not an issue; whereas in depression they are *present*, but accompanied by an acute awareness that now they are, for the depressed individual, painfully incapable of fulfilment.²⁰

APPENDIX 5

HEMISPHERE DIFFERENCES AND MORALITY: REVIEW OF NEUROPSYCHOLOGICAL EVIDENCE

This evidence should not be read in isolation from its context in the overall argument of Chapter 26.

There are a number of aspects to this. One is the superior involvement of the right hemisphere in making moral judgments. Another is its greater involvement in inhibition, an essential aspect of moral behaviour. And most intriguing is the right hemisphere's involvement in promoting prosocial – and the left hemisphere's in promoting antisocial – behaviour.

First, moral judgments. 'The right hemisphere plays an important role in our ability to tell right from wrong', writes David Hecht of University College London, in an excellent review of the literature in this area on which, amongst other sources, I draw here.¹ Assessing the morality of actions, moral reasoning, and promoting prosocial norms all depend on the proper functioning of the right hemisphere. Investigation of a split-brain patient shows that the right hemisphere is 'not only necessary, but also sufficient, for intent-based moral judgement.'² Hecht continues:

Collectively, the studies with healthy and brain damaged participants suggest that the right hemisphere is involved, to a relatively greater extent than the left hemisphere, in mediating empathy and compassion. The left hemisphere, on the contrary, is more involved in mediating anti-social emotions and mental states (eg, gloating and justifying a crime).

Activity in the right posterior superior temporal cortex is correlated with altruistic tendencies.³ The right dorsolateral prefrontal cortex ‘not only participates [in] a rational cognitive control process, but also integrates emotions generated by contextual information’, a process which is ‘decisive’ in reaching moral judgments.⁴ When unpleasant moral and non-moral stimuli were compared, ‘the most striking findings’ were increases in activations in the right hemisphere (medial orbitofrontal cortex, medial frontal gyrus and surrounding the posterior superior temporal sulcus).⁵

Our sense of fairness, too, it seems, is underwritten by the right hemisphere, particularly again by the right dorsolateral prefrontal cortex, and with suppression of this area, we act more selfishly.⁶ In males (at least), empathic responses are shaped by valuation of other people’s social behaviour, such that they empathise with fair opponents while favouring the punishment of unfair opponents. In particular, they are willing to make sacrifices in order to punish unfair behaviour, so-called altruistic punishment, which benefits the group at the cost of the individual.⁷ This behaviour is right hemisphere-mediated, as are judgments of fairness generally, including the unfairness of not punishing unfairness.⁸

The right hemisphere tends to make moral judgments by reference to the intention of the doer (deontology), the left hemisphere by reference to the consequences of the deed (utilitarianism): and ‘normal judgments of morality require full interhemispheric integration of information critically supported by the right temporal parietal junction and right frontal processes’.⁹ Issues of morality depend on being able to understand what is going on in another person’s mind.¹⁰ This is the faculty known as ‘theory of mind’, which is impaired in individuals on the autistic spectrum. Such individuals find it difficult to pick up indirect expressions, hints, tone of voice, irony, facial expressions, body language and all the other ways we tend to infer what is going on in another person’s mind – which may be very different from what they say. Right hemisphere damage impairs each of these indirect expressions and their interpretation; unsurprisingly, then, damage to the right frontal lobe makes us less capable of seeing another’s point of view, and impairs insight into our own mental processes.¹¹ More generally, right hemisphere damage tends ‘to predispose the individual to misinterpret complex information and integrate irrelevant stimuli into false beliefs’,¹² suggesting that moral judgment is likely to depend to a large

extent on the right hemisphere. There are a number of lines of evidence that suggest that this is indeed the case.

Then, inhibition. The right hemisphere – far from its popular caricature as the ‘let-it-all-hang-out’ hemisphere – is responsible for inhibition, the necessary counterpart to emotional, intellectual and spiritual health.¹³ ‘One of the striking aspects of the studies reviewed’, writes Marie Banich, a cognitive neuroscientist at the University of Colorado,

is the clear lateralization of function, with right prefrontal regions differentially engaged as compared to left prefrontal regions across most aspects of inhibitory control. As of yet, the underlying reason for this rather dramatic degree of lateralization remains unclear ...¹⁴

It seems to me that the key role of the right hemisphere in making sure that a response is appropriate in context implies just such a capacity to inhibit. Interestingly, in the light of the greater contribution made to intelligence by the right hemisphere, inhibitory control is more efficient in those of higher intelligence.¹⁵ Similarly there is an association between adopting ‘a global mindset’ – another right hemisphere connection – and greater self-control in the presence of temptation.¹⁶ Since we know that such a mindset is associated with taking longer-term views,¹⁷ this may operate by bringing to mind the consequences of one’s current decisions and actions *in the long run*; or simply of *broader* consequences of one’s actions at any one moment. The right frontal lobe’s capacity to inhibit our natural impulse to selfishness means that it is also the area on which we most rely for self-control and the power to resist temptation.¹⁸

And then there is the issue of prosocial behaviour – or otherwise. A sizeable body of research indicates that the right hemisphere is more prosocial and the left hemisphere more antisocial in its style.¹⁹ Feeling others’ pain predicts prosocial behaviour,²⁰ and feeling others’ pain is largely right hemisphere-dependent.²¹ According to the research of psychologists Julius Kuhl and Miguel Kazén, power-seeking, instrumental, means-to-ends motivations are associated with the left hemisphere; prosocial, relational, co-operative and non-instrumental motivations with the right hemisphere.²² ‘At a conscious level’, writes neuropsychologist

Allan Schore, ‘the left side of the brain concerns itself primarily with power motives, while the right side of the brain is steeped in affiliation drives.’²³

An assessment from medical records, by clinicians blind to brain scan data, of the extent of criminal, aggressive, or sexually deviant behaviour, alienation from family, friends or employers, financial recklessness, and abnormal emotional and social responses exhibited by patients with frontotemporal dementia found that undesirable behaviour was an early presenting symptom in 11 out of 12 right-sided cases, but in only 2 out of 19 left-sided cases.²⁴ A study of temporal lobe atrophy reached a similar conclusion, namely that aggressive and antisocial behaviour followed atrophy of the right, but not of the left, temporal lobe.²⁵ Violent sexual sadists have been repeatedly shown to exhibit right temporal deficits.²⁶

This is in line with the fact that motivation research ‘consistently shows that individuals with a propensity to engage attentional functions of the right hemisphere ... show more socially adaptive behaviour than individuals with a propensity to engage attentional functions of the left hemisphere’.²⁷

There are positive anatomical and physiological relationships between the right hemisphere and prosocial personality traits. Affiliativeness (the desire for benign social connectedness),²⁸ agreeableness,²⁹ and a tendency to trust other people³⁰ all implicate the right hemisphere – the last of these, essential for the formation of and sustaining of rewarding social relationships, is associated with activity in the right ventrolateral prefrontal cortex (which lies adjacent to an area, the right ventromedial prefrontal cortex, that is well-known to be dysfunctional in psychopaths). And a disposition towards gratitude – being appreciative of and thankful for the kindness of others – correlates with the volume of the right inferior temporal cortex.³¹ By contrast, the volume of the left lateral orbital gyrus correlates with Machiavellianism – the tendency to manipulate other people in order to control and exploit them for one’s own benefit.³² Patients with damage mostly in their left hemisphere reveal greater levels of warmth, sociability and agreeableness, whereas right hemisphere-damaged patients tend to try to control and dominate: trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness correlate positively with right orbitofrontal, and negatively with left orbitofrontal, volume.³³ Moreover, studies of lesion patients show that right hemisphere damage can lead to

sexual aggression, physical assaults and acquired psychopathy.³⁴ When normal subjects were engaged in mental simulations of immoral acts, there was ‘a remarkable shift’ in their brain activity towards the left hemisphere.³⁵ As Hecht comments, ‘these studies suggest that moral and immoral thinking are associated with activity in the right hemisphere and left hemisphere, respectively.’³⁶

Guilt is often a motivator for prosocial behaviour: only psychopaths have no capacity for guilt. The level of guilt felt by subjects correlates with activation of the right frontal, specifically right orbitofrontal, cortex.³⁷ Suppressing right prefrontal cortex facilitates lying and reduces the levels of guilt subjects feel about their deceit.³⁸ Incidentally, psychopaths exhibit thinning in the right frontal and temporal cortex, specifically in grey matter, when compared to normal controls.³⁹ I mentioned earlier that there is, as Werner Scheid astutely observed, a ‘pointer of guilt’ that is turned inwards on the self in depression (a right frontal predominant state), whereas in paranoia (a left hemisphere predominant state) the finger of guilt is turned firmly outward, pointing at others: our condition is always someone else’s responsibility, never our own. This also appears to be a defining characteristic of modern society.⁴⁰

I have already mentioned that anger, aggression and hostility are associated with a relatively greater activity in the frontal left hemisphere compared with the right.⁴¹ This has been confirmed repeatedly by scanning and EEG studies, including an EEG study of extremely violent offenders with long-term prison sentences, compared with normal subjects;⁴² by the finding that enhancing left hemisphere activation in normal subjects gives rise to higher levels of anger and aggression;⁴³ and by neuroanatomical studies which found that aggression is associated with a larger left orbitofrontal cortex,⁴⁴ and a reduced right anterior cingulate cortex.⁴⁵ Psychopathy is associated with a hemisphere imbalance steeply skewed towards the left hemisphere.⁴⁶

It may be neither possible nor desirable to avoid conflict altogether, but whether that conflict turns out to be creative or destructive seems to depend on hemisphericity even more than motivation. Inhibition is largely associated with the right hemisphere, as described, and experimental measures of inhibition have been independently verified as indicating attention to the left visual field (right hemisphere).⁴⁷ Even where subjects

are motivated by power rather than affiliation, those with right hemisphericity on visual field testing show more socially adaptive behaviour, predicting 'management success as reflected in high organizational clarity and team morale', rather than a 'self-aggrandizing leadership style'.⁴⁸ And even where subjects are motivated by affiliation rather than power, those with left hemisphericity on testing evince 'high levels of physical and psychological partner abuse'.⁴⁹ As psychologist and neuroscientist Oliver Schultheiss writes,

this is consistent with McGilchrist's hypothesis, based on a large neuropsychological literature, that individuals who get stuck in a left hemisphere information processing mode (as opposed to those with a right hemisphere-favouring mode and/or fluid interhemispheric information exchange) have a peculiar maladaptive mindset ... characterized, for instance, by reality distortion through denial of expectation-violating information, an inability to deal with ambiguity, a tendency to view and treat others as mere tools for the advancement of one's interests and goals, and a profound lack of empathy.⁵⁰

APPENDIX 6

HEMISPHERE DIFFERENCES AND BEAUTY: REVIEW OF NEUROPSYCHOLOGICAL EVIDENCE

This evidence should not be read in isolation from its context in the overall argument of Chapter 26.

Dahlia Zaidel states: ‘No current research would suggest that the right hemisphere specializes in aesthetic judgment.’¹ Let’s have a look.

Seeing the wood for the trees will be difficult, because both hemispheres are inevitably involved at some point, in some way, in aesthetic appreciation. For this reason, looking at brain scans is like trying to interpret a painting of Monet’s by getting closer to the coloured dots: too much conflicting detail that can be understood only by standing back. In teasing out which is the more important hemisphere, it is the effects of cerebral lesions on the appreciation of beauty that should be particularly revealing: if lesions in one hemisphere have a consistently much greater impact than lesions in the other, that would be highly informative about hemisphere difference. Since appreciation of beauty is one of the least manifest impairments after a stroke, doesn’t fit neatly into any of the standard neurological categories, and is seldom if ever enquired about by clinicians, it is not often reported, and still less often recorded in print. However, as it happens, David Fischer and colleagues at Harvard Medical School assembled four cases of, specifically, the loss of appreciation of visual beauty – three from a review of the literature, and one of their own.²

The first was the case of a man who reported that ‘he could no longer become emotionally or sexually aroused by visual stimuli, and that his visual world had become drab and uninteresting’:

Once an assistant city planner, he was no longer able to appreciate subtle aesthetic differences between buildings. He had ceased hiking because he found natural scenery dull, 'all the same'. He complained bitterly about his loss of emotional reaction to viewing pretty girls or erotic visual stimuli. He had cancelled his subscription to *Playboy*, and had withdrawn from heterosexual contact because he found it difficult to become aroused by visual cues.

It was also noted that he approached 'complex visuoperceptual tasks in a piecemeal, feature-analytic manner that greatly compromised speed and accuracy'.³

The second concerned a woman who 'especially appreciated aesthetics; she was fond of painting aquarelles and enjoyed taking care of the many flowers that grew in her garden'. Following her stroke she complained of

a lack of emotive reaction elicited by visual stimuli that formerly aroused a powerful feeling of well-being or contentment: 'I loved flowers so much before ... Their charm doesn't enter my mind anymore. Looking at the landscape through the window, I see the hills, the trees, the colours, but all those things cannot convey their beauty to me ... Everything looks ordinary, indefinite. I feel indifferent about it. What I lack is feeling.'⁴

The third was a middle-aged man who complained that

Flowers to me have lost their essence, I fail to see them as part of nature. They have become almost synthetic, artificial, I seem to lack a kind of knowledge, no, it's not really a knowledge, rather a certain clarity to see nature itself. I fail to see the flower in all its authenticity ... Just as with flowers, there is also an emptiness to landscapes. I cannot appreciate them, I cannot grasp the beauty of nature. I lack a kind of lucidity, a lucidity in my vision that would normally allow me to appreciate it; its colours, the temperature of its colours so to speak. I cannot think of a right word to explain it. I just cannot enjoy that sense of beauty that nature brings.⁵

And the last is their own case, a man who following a stroke noted a ‘sense of visual estrangement’, his feelings being cut off from what he saw, and whose surroundings did not ‘feel real’, which he attributed to a sense of emotional disconnectedness from his visual perceptions.

Note ‘ordinary, ‘all the same’, failing to arouse ‘emotive reaction’, ‘artificial’, lacking ‘authenticity’. All of this – together with ‘a piecemeal, feature-analytic manner’ – suggests right hemisphere disruption. So what did the authors find? Their principal finding was that ‘all four lesions specifically overlapped with the expected trajectory of the right inferior longitudinal fasciculus’. This an important white matter tract connecting the temporal and occipital cortex, and involved in the internal coherence of right hemisphere function, so a very significant finding. Meanwhile Massimo Marianetti had found decreased perfusion of the right, but not left, medial temporal lobe caused by drug toxicity in a subject with ‘visual hypoemotionality’ similar to that described in these cases.⁶

It is notable that the condition is ‘frequently associated with prosopagnosia’,⁷ and other right-lateralising signs such as *déjà vu*, as indeed it was in some of these cases.

By contrast, a man with a glioma of the *left* temporal lobe, and a consequent right-sided visual field defect – thus indisputably involving limitations of the left hemisphere’s perceptual system – saw flowers as ‘extraordinarily beautiful’, odours ‘intensified’, his vision ‘remarkably keen’.⁸

It is notable that Minkowski describes a schizophrenic subject who is reminiscent of Sacks’s ‘Dr P’ (see discussion in Chapter 21). He had lost *Gestalt* perception. Of him, Minkowski reports that his mind

decomposed every object that it met. The clock ... was not just a clock but an assemblage of instruments of torture – cogs, key, hands, pendulum, etc. Every object that he saw was like the clock ... The essential values of an object or another being – such as the aesthetic value – could not be appreciated by him; he was unable to adopt the appropriate attitude. ‘You see these roses?’ he asked me. ‘My wife would say that they are beautiful but, as far as I can see, they are just a bunch of leaves and petals, stems and thorns.’⁹

Let us turn to music. Loss of the ability to appreciate music is called amusia. I have reviewed the lateralisation evidence in *The Master and his Emissary*. Most cases of acquired amusia in which language is spared are due to right hemisphere lesions, and cases are more severe where there is right hemisphere involvement.¹⁰ In congenital amusia, structural MRI studies point to an extended network involving temporal and frontal lobes principally of the right hemisphere;¹¹ and a functional MRI study of individuals with congenital amusia revealed reduced activity in the right inferior frontal gyrus to small pitch changes.¹²

However, one needs to distinguish music perception and recognition from the aesthetic sense, the ability to see and feel its beauty. Some patients, with classical amusia, have impaired recognition of music despite a preserved affective response to it.¹³ Others, by contrast, who exhibit ‘musical anhedonia’, have technical understanding and can recognise, perceive and play music normally – they just cannot appreciate it. There are seven such cases reported in the literature.

A conductor who sustained a right putaminal haemorrhage ‘found himself unable to have any emotional experience while listening to music’:

He could not elicit interest from any type of music, even his favourite genre ... Before the illness he felt great joy and ‘chills’ when the harmony sounded complete ... He felt that the sound was dull and lacked freshness, though he could acoustically recognise that the harmony was correct in its physical sound properties ...¹⁴

A 24 year-old amateur guitarist experienced a right temporoparietal haemorrhage from an arteriovenous malformation and found that ‘aesthetic pleasure for the musical world had completely vanished’:

On hearing pieces played on the piano, he complained, ‘my perception is changed ... it’s flat, it’s no longer 3-dimensional; it’s only on two planes ... there’s no emotion ...’ His difficulties increased as the presented compositions became more complex: ‘... this is even worse: I can distinguish the different instruments, but I can’t perceive the whole ... in jazz pieces, the relationships between the accompaniment and the soloist escape me.’¹⁵

An elderly retired teacher, who from his youth had been an enthusiastic lover of classical music, found, after a right temporoparietal lobe stroke, that he

could not elicit interest in any music, even his favourite music or artists. He described the music as dull and lacking freshness. He thought that this symptom might be caused by listening to recorded music by the stereo and would disappear if he listened to music at a live concert. At a concert of his favourite singer, he felt that, as was expected, the quality of sound was much superior to the recorded one. But he could not experience any emotional response.¹⁶

A 43-year-old amateur musician was found to have an ischaemic lesion in the right superior temporal lobe, and showed both musical anhedonia and amusia. He complained spontaneously of a loss of the feelings he had been used to experience when listening to music previously.¹⁷

Another man, following right temporal stroke, experienced

‘loss of pleasure’ or ‘loss of aesthetic appreciation’ in listening to music: the patient claimed it was difficult for him to express verbally this loss of ‘aesthetic pleasure’, but, in any case, this feeling was distinct from acoustic distortions and just perceived as ‘aesthetic’.¹⁸

A piano teacher, 10 years after a stroke affecting the right frontoparietal and temporal region, complained that ‘he no longer appreciates music as he used to in the past, and spontaneously reports that he seems to have lost the capacity to “conceive the whole”’.¹⁹

And finally there is the case of a middle-aged radio announcer, which is interesting because his loss followed a *left*-sided infarct, involving the insula and extending into the frontal lobe and amygdala. However in his case it was only, and quite specifically, an emotional response to Rachmaninov preludes that was lost: otherwise his sense of musical enjoyment was preserved.²⁰ So not really a loss of the aesthetic sense? Indeed, some might say that the left hemisphere stroke improved his musical taste.

In six out of the seven recorded cases, then, the deficit was right-sided; in all cases depression had been excluded. It is interesting that two of the cases spontaneously mentioned that the problem was in conceiving or perceiving the whole; that two referred to dullness and a loss of freshness; and that one referred to flatness and a loss of three-dimensionality – all recognised right hemisphere deficits.

To summarise, of the 12 known reported cases of specific loss of the feeling of beauty, the key lesion was right-sided in 11: and in the single case of an *increase* in the feeling of beauty it was left-sided.

Now let us turn to experiments conducted in normal subjects. In the majority of these studies an explicit judgment, most typically articulated in language, is involved – both of which factors skew things towards the left hemisphere. The results are more mixed, but nonetheless still show a right hemisphere preponderance.

According to one recent paper, ‘a substantial body of research suggests that the right hemisphere may have a greater role than the left hemisphere in a number of perceptual processes that may be central to perceiving attractiveness’, including attention to the whole, symmetry judgments and perceptual acuity.²¹ A study of appreciation of beauty in art in experts found that the right hemisphere was preferentially involved.²² In another study, activity in the right, but not left, lateral occipital region was directly and positively correlated with aesthetic evaluation of artistic images.²³ Disrupting the right lateral occipital cortex using transcranial magnetic stimulation ‘decreased aesthetic appreciation of representational artworks’.²⁴ Complexity in aesthetic judgments activated right lateral fronto-orbital and right inferior frontal cortex.²⁵ The three most significant areas of activation in aesthetic, as compared with pure symmetry, judgments were all in the right hemisphere (anterior cingulate cortex, frontomedian cortex, and inferior frontal gyrus).²⁶ In three other studies, activations in aesthetic judgments were either bilateral or right-sided.²⁷ However in one study of experts, activations in aesthetic judgments were either bilateral or left-sided.²⁸ In a series of four experiments, the left side of a stimulus (the part appreciated by the right hemisphere) was repeatedly and robustly shown to be more important than the right side in aesthetic judgments.²⁹ Filmed dance movements that were rated more beautiful produced increased activity in the right premotor cortex.³⁰ Another study of

response to images of varying degrees of beauty showed that the default mode network was activated: the researchers found ‘significantly greater activation in the right ventral striatum for the most highly recommended images’.³¹ (This is of special interest given that inability to experience aesthetic pleasure in schizophrenia is associated with reduced activation in the very same area.)³² However, in this particular study, the majority of areas in which ‘observers were asked to rate the intensity with which each artwork evoked the following evaluative/emotional responses: joy, pleasure, sadness, confusion, awe, fear, disgust, beauty, and the sublime’, by responding to verbal assessments, were in the left hemisphere.

A study of face perception found that activating the right, but not the left, dorsolateral prefrontal cortex increased attractiveness of the faces, irrespective of the sex of the faces or viewers. Identical stimulation over the same site did not affect other facial characteristics such as age: ‘overall, our data suggest that the right dorsolateral prefrontal cortex plays a causal role in explicit judgment of facial attractiveness.’³³ In another study of facial beauty ‘activity in the right orbitofrontal cortex increased linearly as a function of attractiveness’.³⁴

Directing attention in such a way that ‘the majority of the picture [is] located within the left visual field and analyzed by the right hemisphere’ increases aesthetic preference.³⁵ And this holds in advertisements and even abstract paintings.³⁶

I mentioned sex differences. In one study, judgments of beauty, whether of art or natural scenes, were confined to the right parietal lobe in men, but in women responses were bilateral. Nonetheless, the response was also greater in the right hemisphere for females.³⁷ (Injuries to the right posterior parietal lobe can affect the perception of selective aspects of art in either sex.)³⁸

The most comprehensive meta-analysis of neuro-aesthetic processing in explicit judgment tasks to date considered 93 neuroimaging studies, involving only positive judgments, across four sensory modalities: sight, sound, taste and smell. ‘The results demonstrate that the most concordant area of activation across all four modalities is the right anterior insula.’³⁹ In a separate study, a lesion of the right anterior insula affected aesthetic judgment of ambiguous artworks.⁴⁰ Not only do patients with right hemisphere disease display autonomic hyporeactivity,⁴¹ but arousal is

specifically associated with the right insula, the location that is singled out here.⁴²

Not all explicit judgment studies, however, favour the right hemisphere: three studies found bilateral activations with no significant lateralisation.⁴³ And turning to those that find a significant *left* hemisphere contribution to explicit judgment tasks, the most significant is Nadal's study which showed that both male and female participants liked representational paintings more when presented in the right visual field, favouring the left hemisphere: there was no effect for abstract paintings.⁴⁴ However, Coney and Bruce found the opposite: a right visual field preference for abstract paintings, but not for representational paintings.⁴⁵ In either case the right visual field effect is contrary to expectation from much of the rest of the literature. Two fMRI studies report left sensorimotor cortex activations associated with explicit subjective judgments of ugliness.⁴⁶ Compared to reading prose, beauty in poetry increased activity in left hemisphere areas in Chinese subjects listening to Chinese poetry.⁴⁷ (This contrasts with the finding that English-speaking subjects showed specifically right-sided activations relating to both reading poetry and the emotional response to it, a significant finding since almost all verbal tasks activate the left hemisphere.)⁴⁸ As the authors point out, the Chinese subjects were asked to give an explicit judgment, unlike the case of Bohrn *et al* (see below),⁴⁹ who deliberately separated the *experience* of beauty from explicit *judgment*, and found the key area in experience to be the right caudate. Both hemispheres, but more left than right, were activated in a task in which subjects viewing artwork were told to 'experience the mood of the work and the feelings it evokes, and to focus on its colours, tones, composition, and shapes' in an explicit fashion.⁵⁰ I suspect the explicit focus on a procedure is important here. And finally a 3% improvement in aesthetic ratings in an explicit judgment task occurred after stimulation to left dorsolateral prefrontal cortex (in something so variable and hard to measure, it is not clear that a 3% change is significant).⁵¹ Oddly the experimenters did not think to carry out a comparison with the right dorsolateral prefrontal cortex.

It is impossible that such a multifaceted phenomenon should be associated with one area of the brain, or even with one hemisphere exclusively. However, when one turns to studies which focus on the appreciation, rather than explicit critical judgment, of beauty, the picture

leans more clearly (though far from exclusively) towards the right hemisphere. In a particularly revealing study the experience of aesthetic *feeling* was associated with activations that were all right-sided (anterior cingulate, precuneus and inferior frontal gyrus), while aesthetic *judgment* was bilateral.⁵² Another study found that as far as aesthetic ratings are concerned, these tend to be more left-sided, while aesthetic responses tend to be more right-sided, which the experimenters describe as ‘a confirmation of previous findings’, in which the right hemisphere has ‘continuously been associated’ with beauty appreciation.⁵³ A study of EEG responses – event-related potentials – found the ‘contemplative’ rather than judgmental sense of beauty to be right-sided. Another such study found that responses were larger over the right hemisphere than the left during aesthetic ‘appreciation’ in both experts and non-experts.⁵⁴ The right inferior parietal lobule and premotor frontal cortex are activated when watching dance that is found more beautiful.⁵⁵ When subjects were scanned while reading a number of proverbs without explicitly evaluating them, and were subsequently asked to rate them for beauty, beauty was found to have activated the right caudate, anterior cingulate, and cerebellum.⁵⁶ However, at least one study of beauty appreciation (that did not involve making judgments) found no difference between hemispheres.⁵⁷

One of the best ways to narrow down what it is one is assessing in visual aesthetics is to get subjects to compare an image with the same image after it has been subtly altered in ways designed to reduce its aesthetic appeal, and see which areas of the brain respond differently. This can be done by interfering with the composition of a painting, or adding noise to it, or by changing its proportions. In each case the original is, as expected, preferred to its altered version. In viewing the degraded paintings or images, both right and left-sided areas are activated, but the right and left lingual, and right fusiform, gyri are the most significant cortical areas.⁵⁸ In the case of the golden ratio the key area activated is, once again, the right insula.⁵⁹ A more recent study by the same investigators has suggested that the aesthetic response of the right insula is specific to art,⁶⁰ though other studies, as we have seen, suggest that its role must be more widespread, since it is the most consistent area involved in visual beauty appreciation of every kind.

APPENDIX 7

HEMISPHERE DIFFERENCES AND SPIRITUALITY: REVIEW OF NEUROPSYCHOLOGICAL EVIDENCE

This evidence should not be read in isolation from its context in the overall argument of Chapter 28.

In mindfulness meditators, there is ‘a pronounced shift away from midline cortices towards a right lateralised network’, including the right dorsal and lateral prefrontal cortex, right insula, right secondary somatosensory cortex and right inferior parietal lobule.¹ A meta-analysis of 78 functional neuroimaging studies revealed that ‘significant activation clusters for loving-kindness meditation were found in the right somatosensory cortices, the inferior parietal lobule and the right anterior insula.’² In satyananda yoga, all the distinctive activity, both alpha and gamma, was found to be in broad cortical networks in the right hemisphere, providing ‘evidence for a core right-sided (rather than midline) network’.³ There is a clear shift toward right hemisphere dominance in altered states of consciousness, such as the shamanic state, induced by meditation;⁴ and in the shamanic state there is increased activity across the whole range of electrophysiological frequencies in the right (but not left) frontal region, with, in general,

a shift from the normally dominant left analytical to the right experiential mode of self-experience, and from the normally dominant anterior prefrontal to the posterior somatosensory mode ... Similar neurophysiological markers have been documented in diverse trance states including yoga and shamanic practices; Zen Buddhist and transcendental meditation ... This may represent a

core feature of altered states of consciousness resulting from right-hemispheric activation and homologous trans-callosal inhibition of contralateral left hemispheric functions responsible for ordinary, ego-bound states of consciousness.⁵

The type of meditation may make a difference, in reassuringly predictable ways: visual meditations result in increases in gamma activity mainly in the right posterior region; in meditative self-dissolution the increases are mainly in the right anterior region; but in verbal mantra meditations, they are mainly left central.⁶

Significant both state and trait changes – ie, changes that generalise and persist outside of specific practices – were found in mindfulness meditation practitioners, marked by increased gamma power in the right posterior cortex when compared with controls.⁷ Measures of connectivity within, rather than between, hemispheres are asymmetric in mindfulness meditators, being higher in the right hemisphere and lower in the left hemisphere.⁸ And anatomical, as well as neurophysiological, changes have been observed. In meditators, cortical thickening has been observed in the right insula, and the somatosensory and inferior parietal lobule of the right hemisphere;⁹ increased grey matter volumes have been found in the right angular and posterior parahippocampal gyri of loving-kindness meditators;¹⁰ mindfulness practitioners show an increased grey matter volume in the right insula and hippocampus (regions related to intuitive bodily awareness and the regulation of emotion, respectively);¹¹ and meditators more generally have been shown to have larger right hippocampal volumes than controls.¹² (However, for completeness' sake, and to remind us how complex the subjects of measurement must be, in another study the left hippocampus was found to be larger than controls;¹³ and yet another study linked types of meditation in which self-other boundaries are blurred with *decreased* activity in the right inferior parietal lobule, an area known to be critical to the sense of the self.¹⁴)

An exception is the achievement of blissful states, which has repeatedly been associated with activation of the left frontal pole. (In Chapter 6 I discussed the association of the left frontal pole with a positive emotional timbre.) Research by Newberg and colleagues underlines that this excitation of the left frontal pole is strongly correlated with suppression of the

superior parietal region in the same (left) hemisphere.¹⁵ In relation to this, it is a possibility that, since meditation of all kinds depends on stilling the normal verbalising activity of the left posterior cortex, the blissful state achieved by some meditators is an (initially incidental) consequence – a ‘side-effect’ – of learning how maximally to recruit the left frontal pole in its capacity to suppress the posterior cortex of the same hemisphere.

A consensus is emerging from the literature that the phenomena associated with religious experience more generally tend to be sustained by the right hemisphere more than the left. This conclusion is supported by two book-length studies of spirituality and the brain, *The Soul in the Brain* by Michael Trimble,¹⁶ formerly Professor of Behavioural Neurology at the Institute of Neurology, Queen Square, in London, and Patrick McNamara’s scholarly *The Neuroscience of Religious Experience*,¹⁷ as well as by an extensive review by Orrin Devinsky and George Lai.¹⁸ Having said all this, it should be emphasised that there is no reductive intent in any of these authors: for instance, McNamara writes that he is ‘not interested in debunking religion’s supposed pretensions or calling it “nothing but ...”’¹⁹ McNamara largely implicates right frontotemporal networks, as do others:²⁰

although the range of variance in religious experiences across cultures and time epochs is unknown, I find that changes in religious experiences in the samples of subjects that have been studied with cognitive and neuroscientific techniques are, in fact, reliably associated with a complex circuit of neural structures ... [structures which] nearly always include the key nodes of the amygdala, the right anterior temporal cortex, and the right prefrontal cortex.²¹

Devinsky and Lai, following William James, distinguish the ‘religion of the everyday man’, with its characteristic ongoing belief pattern and set of convictions, predominantly localised to the frontal region, from ecstatic religious experience, more localised to the temporal region, both in the right hemisphere.²²

Pathology of a religious nature, by contrast, seems to be associated with the left hemisphere. Religious delusions, like other delusions,²³ are associated with increased left frontal and temporal activity.²⁴ Hyper-

religiosity in subjects with epilepsy has been associated with a decreased volume in the right hippocampus.²⁵

As is clear, much depends on what is meant by religion. In some studies what is measured is essentially a pathological hyper-religiosity; in others an openness to ritual; in others the holding of certain beliefs or practices; in others experiences of a 'paranormal' kind. As if to demonstrate difficulties with generalisation, in one study the right hemisphere appeared foundational for aesthetic religious experience, while the left hemisphere was associated with ritual religious experience,²⁶ a distinction that, however it may work in the laboratory, falls short of the complexity of real-life experience.

APPENDIX 8

THE 'INCOMPATIBILITY' OF SCIENCE AND RELIGION, AND THE HARMFUL NATURE OF RELIGION: SOME EVIDENCE TO THE CONTRARY

This appendix contains the following sections:

1. Scientists and religious belief;
2. Religious institutions and science;
3. Religion as brainwashing;
4. Religious belief and the health of individuals and societies.

This evidence should not be read in isolation from its context in the overall argument of Chapter 28.

(1) Scientists and religious belief

Jerry Coyne seems to think it self-evident that science and religion are incompatible. What does he make, then, of the existence of so many great scientists that thought and think that such a view is just as clearly mistaken, not to say naïve? My point here is not that they are right or wrong to accept a religious view: just that they do accept one, in plain contradiction to Coyne's statement that science and religion are incompatible.

When confronted with the overconfident, even contemptuous, pronouncements of some scientists to the effect that God does not exist, I think of Bohr's openness to religion, quoted in Chapter 28. And Heisenberg's. He too saw further – and saw the rather elementary mistake Coyne and his kind are making, to do with different kinds of knowledge expressed in different kinds of language:

Above all else one must be clear that in religion language is used in an entirely different way from that in which it is used in science. The language of religion is closer to that of poetry than that of science ... one of its most important tasks is, with its language of images and parables, to keep us *mindful of the wider context* ... We know that in religion we are dealing with a language of images and parables, that can never precisely convey what is meant ... At the end of the day, the central Order, or the 'One' as we used to say, with which we commune in the language of religion, must prevail.¹

The point Heisenberg makes about context seems to me enormously important. As always the tendency of the left hemisphere is to narrow focus so drastically that it fails to see the broad picture at all, and therefore cannot detect that anything is missing when its impoverished picture becomes a supposed representation of the whole.

It should also be remembered that much in contemporary science itself can be expressed only in poetic language – a point Bohr makes. Moreover, some of its posited entities, such as 'dark matter' (which is thought to constitute about 85% of all matter) and 'dark energy', are neither visible, nor tangible, nor even directly detectable. That's without considering 'multiverses' and 'many worlds'. These are non-empirically verified and in some cases non-empirically verifiable, theoretical constructs, proposed in order to explain what *can* be detected.

I quoted Max Planck on the idea that spirit, not matter, alone exists. 'Visible, perishable matter – that is not what constitutes the real, true and actual', he continued: 'it is the invisible, immortal spirit that is the truth.' And he went on to say that we are compelled to see behind this spirit a creative force:

I am not afraid to call this mysterious creator, as have all the civilized nations of the earth for thousands of years: God. So you see, my dear friends, how in our days, in which people no longer believe in spirit as the foundation of all creation, and therefore find themselves in bitter estrangement from God, it is precisely the minute and the invisible that leads truth back from the grave of

materialist delusion, and opens doors into the lost and forgotten world of the spirit.²

Einstein's views on organised religion were largely, though not wholly, dismissive; but he did not deny a religious feeling to the scientist, which 'takes the form of a rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection.'³ Call that what you like, it is not far at all from a sense of a transcendent intelligence revealed in the order of the cosmos that inspires awe and rapture – in fact that is exactly what it is. Someone who had no belief in any kind of God could not say that. Einstein time and again reflected, as incidentally have all the great spiritual masters, that such questions are beyond the capacity of human intelligence to fathom. He further commented: 'in view of such harmony in the cosmos which I, with my limited human mind, am able to recognise, there are yet people who say there is no God. But what makes me really angry is that they quote me for support of such views.'⁴

Einstein's colleague Kurt Gödel, probably the twentieth century's most important mathematician, went much further. He was a Lutheran, who read the Bible regularly, believed in an afterlife, and thought that it was impossible to give a credible account of reality without God.⁵ Of an afterlife, he wrote that it is 'possible today to perceive, by pure reasoning' that it 'is entirely consistent with known facts ... If the world is rationally constructed and has meaning, then there must be such a thing'.⁶ He also thought that rational religion requires 'a direct connection of each individual to God or the whole or what is ultimate';⁷ that 'mechanism in biology' was a fallacy; and that the doctrine that there can be 'no mind separate from matter' would one day be scientifically disproved.⁸

Equally there have been few mathematical minds greater than that of the physicist John von Neumann, who quite apart from his contributions to pure maths, made foundational contributions to quantum mechanics, hydrodynamics, game theory, computing and statistics. 'A mind of von Neumann's inexorable logic had to understand and accept much that most of us do not want to accept and do not even wish to understand', wrote Eugene Wigner.⁹ Neumann's verdict on God? 'There probably is a God.

Many things are easier to explain if there is than if there isn't.'¹⁰ Whatever else one might say about that, it would seem that, at least, he saw no incompatibility.

In the words of the Nobel-winning neurophysiologist and philosopher Sir John Eccles: 'Science and religion are very much alike. Both are imaginative and creative aspects of the human mind. The appearance of a conflict is a result of ignorance.'¹¹

Here I have referred to a minute fraction of scientists, all from within the last 100 years, many of them amongst the greatest that ever lived, who demonstrate that the assertion that 'science and religion are incompatible' is simply wrong. I could, of course, have referred to many more: but even one robust case is enough to refute Coyne's argument, let alone more than 95% of Nobel laureate physicists.

(2) Religious institutions and science

There has been a very one-sided appraisal of the part played by religious institutions in the history of science. Much – probably a majority – of all important scientific research over human history in the West was actually carried out by clergy. In a world where a large number of highly educated people took holy orders that is perhaps not surprising; but the evidence that these men experienced conflict between pursuing science and sustaining their religion is scant, and they received munificent support from the Church. Until recently scientists saw, not only no conflict, but an obvious synthesis of knowledge between religion and science: in discovering the awe-inspiring coherence and beauty of the world, they felt they were uncovering the work of a great and divine intelligence, and thereby coming into the presence of God. (Newton, a religious man, saw his real contribution to knowledge as his theological writings.) Natural philosophy (which is what science used to be called), natural history and astronomy, were almost entirely sponsored by the Church; and these disciplines were originally based on the writings of Aristotle and Ptolemy – the best scientific tracts Europe had – as transcribed by Syrian Christians and preserved by Islam. At the fall of Muslim Toledo to the Christians in 1085, the libraries were not ransacked, but rather the texts zealously safeguarded and translated into Latin by European monks.

With the Middle Ages came the era of innovation. Mediaeval science was sophisticated, and laid the foundations for the Newtonian revolution. Robert Grosseteste, who was Bishop of Lincoln in the first half of the thirteenth century, is credited with being the first person to outline what is now known as the scientific method, and made important advances in astronomy and optics. His pupil Roger Bacon, a Franciscan monk, emphasised empirical methods and made experimental discoveries in physics and chemistry. The polymathic fifteenth century theologian and cardinal, Nicholas Cusanus, ‘anticipated many later ideas in mathematics, cosmology, astronomy and experimental science.’¹² He had insights that took up to four centuries to be proven, but which eventually became established scientific or mathematical truths.¹³

The myth that people believed the earth was flat until Columbus proved them wrong is an example of major, motivated, misdirection. As early as the sixth century BC, Pythagoras – and later Aristotle and Euclid – wrote about the earth as a sphere. Eratosthenes at the beginning of the second century BC devised a method for calculating, fairly accurately, the circumference of the spherical earth.¹⁴ When Ptolemy wrote his *Geography* in the second century AD he considered the idea of a round planet as taken for granted. An important tract of the thirteenth century, Sacrobosco’s *Sphaera Mundi*, widely read across Europe, contains a clear description of the Earth (not just the wider cosmos) as a sphere, in accord with established opinion in Europe at the time. According to Jeffery Burton Russell, Emeritus Professor of History at the University of California,

with extraordinarily few exceptions *no* educated person in the history of Western Civilisation from the 3rd century BC onward believed that the earth was flat ... the sphericity of the earth was accepted by all educated Greeks and Romans. Nor did this situation change with the advent of Christianity. A few – at least two and at most five – early Christian fathers denied the sphericity of the earth by mistakenly taking passages such as Psalm 104, verses 2–3, as geographical rather than metaphorical statements. On the other side tens of thousands of Christian theologians, poets, artists, and scientists took the spherical view throughout the early, mediaeval, and modern church. The point is that no educated person believed otherwise.¹⁵

Of the myth of Columbus he writes, ‘The courage of the rationalist confronted by the crushing weight of tradition and its cruel institutions of repression is appealing, exciting – and baseless.’¹⁶ The idea that in the Middle Ages people believed the earth was flat was in fact a deliberately engineered nineteenth-century invention designed to bolster (quite unnecessarily, since science needed no bolstering) an attack on religion, seen as an impediment to science:

the falsehood about the spherical earth became a colourful and unforgettable part of a larger falsehood: the falsehood of the eternal war between science (good) and religion (bad) throughout Western history. This vast web of falsehood was invented and propagated by the influential historian John Draper (1811–1882) and many prestigious followers, such as Andrew Dickson White (1832–1918), the president of Cornell University, who made sure that the false account was perpetrated in texts, encyclopaedias, and even allegedly serious scholarship, down to the present day.¹⁷

No historian nowadays takes Draper or White seriously, though Coyne, who bases part of his argument on their testimony, would seem not to be aware of this.¹⁸

Another *locus classicus* for the ‘war’ between science and religion, according to its proponents, is that of the earth not being at the centre of the universe. First of all, it is a popular misconception that being at the centre of the universe was considered a position of prestige, and that, hence, the disproof of geocentrism by Copernicus was a blow to human dignity. Quite the opposite is the case. The centre was where the lowest parts of creation remained, the more exalted occupying positions in ever higher circles removed from the centre:

pre-Copernican cosmology pointed not to the metaphysical or axiological ‘centrality’ but rather to the sheer grossness of humankind and its abode. In this view, the earth appears as a universal pit, figuratively as well as literally the world’s low point.¹⁹

This was a view shared by Christian, Jewish and Islamic writers, with particularly clear expositions by Maimonides in the twelfth century ('in the universe, the nearer the parts are to the centre, the greater is their turbidness, their solidity, their inertness, their dimness and darkness, because they are further away from the loftiest element, from the source of light and brightness'),²⁰ and Al-Biruni in the eleventh ('in the centre of the sphere of the moon is the earth, and this centre is in reality the lowest part').²¹ 'This negative view encompasses ... not only ancient and mediaeval Arabic, Jewish, and Christian writers', writes Dennis Danielson, 'but also many prominent voices that we usually associate with Renaissance humanism, both before and after the time of Copernicus.'²² A quarter of a century after the publication of Copernicus' *De Revolutionibus*, Montaigne took up the same theme, declaring that we are 'lodged down here, among the mire and shit of the world, bound and nailed to the deadeast, most stagnant part of the universe, in the lowest storey of the building, the farthest from the vault of heaven.'²³

The Church was committed to astronomical observation: as well as funding virtually all hospitals, schools and universities for over a thousand years, it funded observatories and meteorological stations since the late Middle Ages. Copernicus was a canon of Frauenburg Cathedral. Nor was his theory rejected, but on the contrary enthusiastically welcomed by a number of cardinals,²⁴ as well as by Pope Clement VII himself, who invited him to lecture to an assembly of bishops and cardinals in the Vatican, and extravagantly rewarded the scholar Johann Widmanstetter, the Papal secretary who brought Copernicus to his notice.²⁵ 'As a matter of fact', writes Claudio Ronchi, 'heliocentric doctrines ... already circulated in classical antiquity as well as in Muslim and Christian Middle Ages.'²⁶ It is often said that Giordano Bruno was somehow a martyr to science, but when he was burned at the stake as a heretic, 'it had nothing to do with his writings in support of Copernican cosmology'.²⁷ His mistake was his refusal to renounce heterodox religious beliefs, and had nothing to do with science. He was, then, a martyr, not to science, but to his religious beliefs (he did not understand Copernicus's science). A century later, however, interestingly under pressure from the literalistic, left hemisphere-dominated mentality of Reformed theologians, the Roman Catholic Church decided it had better ban Copernicus's teaching, a ban that remained in place for two

hundred years – indisputably an egregious mistake by a hugely powerful institution. But it does not in itself make science and religion enemies.

And, then, a very large part of scientific progress, up to about 100 years ago, is owed to the work of clergy, often in rural livings – gifted outsiders with intelligent, educated minds, and leisured enough to undertake patient observation and repeat experiments, untrammelled by the conformist pressures of a modern university career. With few exceptions, far from resisting science, as is often implied, they were themselves the makers of science. At the same time scientists have themselves, at times, resisted scientific discovery. ²⁸

Gregor Mendel, the father of modern genetics, was an Augustinian friar whose experiments took place in a monastery garden. And in the twentieth century it was a Catholic priest, the cosmologist Georges Lemaître, who proposed the Big Bang theory. There is no conflict, implicit or explicit, here between religion and science.

Until the nineteenth century (the high point of belief in mechanistic science), it would never have occurred to anyone that there need be a war between religion and science. It was only then that the term ‘natural philosophy’ was abandoned, and the word ‘science’, which simply means knowledge, appropriated to that which was practised by a certain caste, with their own rituals, myths – including, prominently, those that denigrated religion, but also those that oversold what science can achieve – and an unproven but historically very unusual materialist creed. The idea of this war between science and religion was bolstered by the generation of a powerful nineteenth-century mythology of science’s own fabrication, some of which we have seen, and featuring two cover stories: the supposed ‘martyrdom’ of Galileo, and in a lesser role, the reported triumph of TH Huxley over Bishop Samuel Wilberforce at a debate in Oxford. The science behind Galileo was not universally accepted; there were scientists who opposed him and theologians who were on Galileo’s side. His misfortunes had much to do with his personality, and his martyrdom amounted to being allowed to live out his life at his comfortable rural estate on the outskirts of Florence. While the events behind these stories did take place, the realities are complex; the stories often told are tendentious half-truths, and suggestive of the grounding of a cult. Cults motivate themselves by having adversaries.

It is absolutely true that there arose in the middle of the nineteenth century, at the same time as the attack on religion by science, an authoritarian attitude in the Roman Catholic Church, especially under the papacies of Pius IX and X, to free thinking of any kind, including science. This was a heinous mistake. It is not unreasonable to see the Church, especially at this point, as having constituted an oppressive cultural institution. But its recalcitrance might also be seen as a reaction to the aggressive attitude of those already fanning a 'war' between science and religion at that time, and suggesting that science was incompatible with religion. When such conflicts are invented, both parties inevitably become defensive, polarise their positions, and consequently fulfil their opponents' skewed beliefs. Extreme views are often a reaction to the perception of extreme contrary views. In any case, this Papal posturing had very little influence, if any, on the course of science, and represents only an episode in a long history.

Darwin gets dragged into the unseemly squabble between misunderstood science and misunderstood religion in a way he, in his modest agnosticism, would not have appreciated. Darwin's importance is not in fact rightly understood by many of his disciples. Addressing the topic of what he contributed to our thinking, and as a preamble to celebrating his true greatness, biologist and philosopher of science John Wilkins disposes of some myths:

Darwin's theories (plural) are not controversial because they imply that species are mutable. This was a widely held view by preachers, moralists, Aristotelians, naturalists, breeders, formalists, folk biology, and even biblical translators ... Darwin was not controversial because he thought the age of the earth was large. This preceded him also, and was settled in the late eighteenth century, although the present value wasn't finalised until the 1960s. Darwin was not controversial because his account of humans being animals contradicted the Bible. Linnaeus [a deeply religious man] knew humans were animals a century earlier [as, by the way, did Goethe], and indeed the only issue was whether humans were animals with souls Moreover, it was Christians who rejected the literal interpretation of the Bible, long before Darwin (beginning with the Alexandrian school in the second century), and those who realised

that the global Flood was a myth (or an allegory) were Christian geologists a half century at least in advance of Darwin.²⁹

What can of course be said is that people who believe that the world was literally created in six days are wrong, and that they are wrong to oppose the idea of evolution in its general sense (beliefs about evolution were not carved in tablets of stone, left hemisphere fashion, but evolve, right hemisphere fashion, as all living traditions do: we are learning inevitably that evolution is far more complex than the narrow neo-Darwinian view would hold). But most religious people do not espouse creationism.³⁰

As for Darwin's views on the existence of a God, he was far more modest than many of the neo-Darwinians: 'I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton.'³¹ Elsewhere he wrote: 'In my most extreme fluctuations I have never been an atheist in the sense of denying the existence of a God.'³²

(3) Religion as brainwashing

Religious experience exists across the life-span, from childhood onwards.³³ The literature attests to the existence of profound religious experiences in children.³⁴ Children's 'intuitive theism' appears to be independent of culture and environment, including parents' beliefs (whether atheistic or theistic), the storybooks that have been read to them or the content of family conversations.³⁵ Young children whose parents are atheists may have religious experience,³⁶ and their religiosity may persist without any specific cultural reinforcement.³⁷ Young children, it turns out, have frequent experience of a naturally 'relational consciousness', as do many non-Western adult cultures.³⁸ According to David Hay, one of the researchers, this involves two elements:

an altered state of awareness as compared with other kinds of consciousness, more intense, more serious and more valued; and the experience of being in relationship – with other people, with the

environment and with God, and in an important sense, in touch with oneself.³⁹

Children are eager to discuss events, experiences and relationships in terms that we would call unambiguously spiritual, and do not shy from talking of what we wrongly call ‘the supernatural’ (wrongly, since, it seems, there is nothing ‘added on’, or ‘outside’ nature, about it). What the research of Nye and her colleague Hay revealed was more like the opposite of the thesis that children would never think in such terms unless they were ‘forced’ to do so: rather, they naturally thought in such terms until they learnt that it was not considered smart to do so, and an alienated, atomistic, inanimate vision of the world was imposed on them at school.⁴⁰ It is at least as arguable that Western children are ‘forced’ to accept what could be seen as a damaging and unnatural cosmology by teachers cowed by the high-decibel, upper case, pronouncements of people like Richard Dawkins.

A meta-analysis of religious experience tried to disentangle the effects of culture on awareness of God. It used a strict criterion for ‘religious experience’, specifically excluding experience of supernatural beings or phenomena such as the spirits of dead relatives, other humans, animals or plants, as well as so-called ‘extrovertive’ experiences⁴¹ involving feelings of unity, knowledge, reality, love, luminosity and so forth in relation to the natural world; and including only experience of something such as a transcendent God or divine realm’.⁴²

The study’s authors reflect that though culture obviously shapes such experience, it is not obvious that it generates it. They point out that, within the same culture, and given the same religious or non-religious background, only some experiences outwith the ‘normal’ range are interpreted in a religious way: for example, bizarre experiences in dreams or psychotic phenomena are usually not.⁴³ Religious experience may arise spontaneously in the most prosaic of circumstances, outside any context suggested by religious doctrine or practice. Equally, within the same culture, not all religious persons claim to have had religious experiences;⁴⁴ non-religious persons may report having religious experiences;⁴⁵ and, despite the fact that the vast majority of people during the more than 70 years of the Soviet Union were raised and educated in a rigorously anti-religious culture, religious experience was still common.⁴⁶

Many people experience moments of transcendence when the world seems to come more alive and to be transformed: when there is a strong subjective sense of being in the closest touch with something much bigger than oneself from which one had been hitherto somewhat removed. Experience of the divine is not necessarily something at all rarefied or ‘super’-natural, but rather a normal and natural phenomenon. ‘My chief desire’, writes Hart,

is to show that what is most mysterious and most exalted is also that which, strangely enough, turns out to be most ordinary and nearest to hand, and that what is most glorious in its transcendence is also that which is humblest in its wonderful immediacy, and that we know far more than we are usually aware of knowing, in large part because we labour to forget what is laid out before us in every moment, and because we spend so much of our lives wandering in dreams, in a deep but fitful sleep.⁴⁷

This insight into the familiar was given its most famous expression by Blake: ‘To see a world in a grain of sand, and a heaven in a wild flower; hold infinity in the palm of your hand, and eternity in an hour.’ He it was who also saw in the sunrise not ‘a round disc of fire, somewhat like a guinea’, but ‘an innumerable company of the heavenly host, crying, “Holy, holy, holy is the Lord God Almighty!”’⁴⁸

What have been called somewhat infelicitously ‘God encounter’ experiences, either with or without the use of drugs, have been studied in a survey of 4,285 subjects:

About 75 percent of respondents in both the non-drug and psychedelics groups rated their ‘God encounter’ experience as among the most meaningful and spiritually significant in their lifetime, and both groups attributed to it positive changes in life satisfaction, purpose and meaning.

More than two-thirds of those who said they were atheists before the experience no longer identified as such afterwards. Most participants, in both the non-drug and psychedelics groups, reported vivid memories of the

encounter experience, which frequently involved communication with some entity having the attributes of consciousness (approximately 70%), benevolence (approximately 75%), intelligence (approximately 80%), sacredness (approximately 75%) and eternal existence (approximately 70%). Both groups reported a decreased fear of death (70% in the psychedelics group, 57% among non-drug respondents). In the non-drug group, participants were most likely to describe their encounter as with ‘God’ or ‘an emissary of God’ (59%), while the psychedelics group were most likely (55%) to describe an encounter with ‘ultimate reality’.⁴⁹

‘Normal’ people report their religious experience as *more* real than ‘baseline’ reality, even when the experience is later recollected from within that baseline reality.⁵⁰ At the same time, ‘normal’ individuals usually refer to dreams as *less* real than ‘baseline’ reality when they are recalled. The same is true for the hallucinations accompanying a psychotic illness – they are appraised as less real, once the episode of illness has resolved.⁵¹

The Upanishads refer to two kinds of knowledge, *apara vidya* (knowledge via the intellect and the senses, limited to a finite world) and *para vidya* (knowledge via the soul, which is not just subjective experience of concepts and emotions, but oneness with the infinite). *Apara vidya* presupposes a knower, a thing that is known, and the act of knowing. *Para vidya*, by contrast, is the attainment of knowledge through oneness with Brahman, the creative principle revealed in the whole cosmos.⁵² It is thought to be the purpose of life to attain *para vidya*. It is relevant that in the Kabbalah, similarly, ‘God, the cosmos, the human soul, and the act of knowledge’ are all a single, unified essence or substance.⁵³

So what about atheism: is that perhaps – as scientists, remember, we must consider everything – a kind of brainwashing inflicted on us by those in society who want to take control? It’s hard to say, but I would think not – at least not in those terms. In a paper entitled ‘The origins of religious disbelief’, psychologists Ara Norenzayan and Will Gervais suggest four possible paths to atheism.⁵⁴ Because there seems to be a (presumably selected for) religious sense in most people, the existence of atheists demands to be explained. They write that ‘one widely discussed view holds that disbelief, when it arises, results from significant cognitive effort against these powerful biases [towards religion]... atheism is possible, but requires some hard cognitive work to reject or override the intuitions that nourish religious beliefs’. They reject this view. ‘We argue’, they say,

that atheism is more prevalent and enduring than would be expected if it was solely driven by effortful rejection of intuitive theism, that disbelief does not always require hard or explicit cognitive effort, and that rational deliberation is only one of several routes to disbelief.

Of the four paths they consider, two concern aspects of the society, and two concern the cognitive style of the individual. The societal aspects are lack of threat ('where life is safe and predictable, people are less motivated to turn to gods for succour ... even within the same society, religiosity declines over time as conditions become more secure');⁵⁵ and a tendency to conform to a culture, often scientific or 'Western liberal', in which belief is stigmatised as unintelligent. On the other hand, the personal cognitive aspects are a tendency to overvalue analytic thinking (more typically atheistic) and undervalue intuitive thinking (more typically theistic); and 'weak mentalizing abilities' (inability to see what the world looks like from another point of view). They conclude:

So is atheism a 'hard sell', as many evolutionary and cognitive theorists of religion have argued? The answer, as is often the case when asking a complex question about a complex phenomenon, is that it depends ...

...on the individual's mental style and on the nature of the society to which they belong.

Since religion is not a matter of ratiocination, primarily – though not of unreason, as I suggested in Chapter 28 – those who find intuitive, emotional and social understanding more difficult are less likely to be religious.⁵⁶ The cognitive style with which we approach the world affects what we find there, and this is just as true of the religious sense as of any other. People with certain cognitive abnormalities, such as autistic spectrum conditions, will find religion to be 'largely inscrutable' and 'cognitively challenging'.⁵⁷ It turns out that autism-spectrum disorders make belief in God less likely (in a series of four studies, neurotypical ('normal') subjects were 10 times as likely as those on the spectrum strongly to endorse God).⁵⁸ According to another study, subjects on the autistic spectrum are more likely than

neurotypical subjects to be atheists, and atheists are more likely to be on the autistic spectrum.⁵⁹ The elements of autistic cognitive style that most closely correlate with atheism are a preference for systematically logical beliefs, and a distrust of metaphor and figures of speech, along with weaker mentalising tendencies. (Theists with high-functioning autism tend to conceive of God as purely transcendent: Temple Grandin, for example, describes God, in an analogy of the complexity-consciousness theory, as the entanglement of millions of interacting particles.)⁶⁰ However I emphasise that this is a tendency only: none of this supports some such simple claim as that atheists ‘are’ autistic. Atheists are not a uniform group any more than theists, and both groups would, and should, resent being dismissed by association with the softest targets.

Research on atheists and personality characteristics found over 85% of the non-believers sampled to be broadly ‘psychologically well-adjusted’, and that personality measures have little correlation with varieties of non-belief. However there was one exception. The researchers distinguished six types of atheists, one of which they described as ‘anti-theists’ (about 14% of atheists). Such persons

view religion as ignorance and see any individual or institution associated with it as backward and socially detrimental ... view the logical fallacies of religion as an outdated worldview that is not only detrimental to social cohesion and peace, but also to technological advancement and civilised evolution as a whole ... [and believe that] the obvious fallacies in religion and belief should be aggressively addressed in some form or another.⁶¹

This group of ‘anti-theists’ were atypical of atheists as a whole, scoring highest of the six groups on four of the personality scales – autonomy, anger, dogmatism and narcissism – and lowest on agreeableness.⁶²

Stronger belief in God is linked to more intuitive thinking. This effect of intuitive thinking is not related to intelligence (IQ), educational level, income, political orientation, or personality.⁶³ Intuitive thinking style is not correlated with a religious upbringing, but with a growing belief in God since childhood irrespective of upbringing, ‘suggesting a causal relationship between cognitive style and change in belief over time’.⁶⁴ It may be

relevant here that a disposition towards religious thinking is partly innate:⁶⁵ genetic variation contributes up to 50% of individual variation in religiosity.⁶⁶ Importantly, though, genes cannot determine the situation anywhere near completely.

There is evidence that on average the religious are less intelligent than non-believers.⁶⁷ But as we saw in Chapter 28, almost all scientific Nobel Prize winners seem to espouse not just the idea of God, in general terms, but a religion: how is that? There are two different questions here that tend to be conflated. One is horizontal: are people in the top half of the intelligence range more likely to be atheists than believers? The answer is ‘no’. The other is vertical: are proportionately more atheists to be found in the top half of the intelligence range than the lower? The answer is ‘yes’. These are, of course, entirely compatible findings.

(4) Religious belief and the health of individuals and societies

The evidence is that religion is a human universal – more so than science – and far from being a product of brainwashing. (Whether any given set of religious beliefs is true or not is of course untouched by this observation on its own.) As CS Peirce reflected, ‘The human mind and the human heart have a filiation to God.’⁶⁸ In modern terms, we are often said to be ‘hardwired’ for God. Again this neither means that our brains make it all up *nor* proves that God exists, though usually our brains have developed faculties of perception in response to elements in the world that are there to be encountered: eg, we are ‘hardwired’ for sight. Whether or not that be the case, ‘scientists who try to dismiss religion as “nothing but” an organic disposition of the evolved human brain’, writes Rée, ‘forget that the same could be said of the natural sciences.’⁶⁹

That the religious, both communally and individually, are happier, and dramatically healthier, both mentally *and* physically, as well as better adjusted, more resilient and more prosocial in their habits, also does not prove that religion is true. But it suggests that we and our societies function poorly when we neglect it, and that human thriving and fulfilment depend on it to a considerable extent. The evidence on this deserves to be better known.

From a purely evolutionary point of view, we ought to find that religious experience contributes to the survival of those capable of experiencing it.⁷⁰ A study of nineteenth-century utopian communities, both religious and secular, demonstrates that religious communities are far more likely to outlast their non-religious counterparts: ‘religious communes are more likely than secular communes to survive at every stage of their life course’ – four times as likely in any given year.⁷¹

Religion is a noted source of a sense of purpose. A study relating sense of purpose in life to longevity found that those with the lowest ‘life purpose’ had a two and a half times greater chance of death in the five-year period of the study than those with the highest. This finding survived adjustments for body mass index, level of physical activity, alcohol consumption, chronic illness, and even smoking status. The finding is in line with those from a number of previous studies in both East and West.⁷²

Oxford’s *Handbook for Religion and Health* is a thorough undertaking, which examined 3,300 quantitative studies published between 1872 and 2010, two-thirds of them since the year 2000, that address the relationship between health and well-being on the one hand and a religious or spiritual disposition on the other.⁷³ The religious or spiritual are markedly better at dealing with adversity, whether that be war, natural disaster, disease, bereavement or approaching death. They also enjoy much greater well-being: out of 326 quantitative, peer-reviewed studies, 256 (79%) found significant positive associations only; and only three studies (less than 1%) reported any significant inverse relationship between being religious or spiritual and well-being. These levels are extremely high by comparison with the norms in social psychology. Similar positive correlations with being religious or spiritual were found for a sense of meaning in life, levels of hope, levels of self-esteem, an internal locus of control (roughly a measure of taking responsibility), altruism, and feelings of forgiveness and gratitude. The meta-analysis found that being religious or spiritual has a protective effect against depression, anxiety, substance abuse and suicide.⁷⁴ It is correlated strongly with personality traits of conscientiousness, agreeableness, extraversion and openness to experience, and is inversely correlated with psychoticism and neuroticism.

This is in keeping with findings of improved health and happiness among the spiritually or religiously minded young. In their examination of the role of religion and spirituality in the lives of American teenagers,

Smith and Denton write: ‘the differences between more religious and less religious teenagers in the United States are actually significant and consistent across every outcome measure examined: risk behaviours, quality of family and adult relationships, moral reasoning and behaviour, community participation, media consumption, sexual activity, and emotional well-being’.⁷⁵

In terms of social behaviour, perhaps most predictably, being religious or spiritual is strongly negatively associated with delinquency or crime,⁷⁶ alcohol and drug abuse⁷⁷ and marital instability; and positively associated with better social supports, and measures of ‘social capital’. It is associated with lower levels of smoking, healthier levels of exercise, and better diet – though not lower weight, the only health measure to be negatively related. In terms of physical health it is associated with lower cholesterol levels; lower incidence of heart disease, hypertension and cerebrovascular disease; improved immune function and endocrine function; and better cognitive function in age.⁷⁸

There are marked effects on longevity, confirmed by four meta-analyses, equivalent in size to the effects of taking cholesterol-lowering drugs, such as statins, or enrolling in exercise-based cardiac rehabilitation regimes.⁷⁹ The authors of one meta-analysis found that, ‘notably, the protective effect [on mortality] of religiosity/spirituality in the initially healthy population studies was independent of behavioral factors’ such as smoking, drinking, or exercising, and of socioeconomic status.⁸⁰

It seems that many of these effects are mediated to a large extent by attendance at a place of worship, and thus attributable to belonging in a group of fellow-worshippers.⁸¹ We know that social connectedness mediates extraordinary benefits in terms both of the social cohesion and well-being of a society, and in terms of individual mental and physical health, the subject of Robert Putnam’s classic book, *Bowling Alone: The Collapse and Revival of American Community*.⁸² However, regardless of the social aspects of religion, religious experience *per se*, including ‘simply’ the experience of awe,⁸³ has positive effects on happiness and prosocial emotions – thus bringing together, the right hemisphere’s role in the experience of awe, in prosocial emotions (each discussed in Chapter 26), and in the experience of the divine (see Chapter 28).

While most studies are carried out in North America or Western Europe, similar results have been found for Islam;⁸⁴ Judaism;⁸⁵ Hinduism;⁸⁶ and Buddhism, Shintoism and Confucianism.⁸⁷ Finally the literature recognises a category of pathological religiosity associated with certain neuropsychiatric disorders.⁸⁸

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Zohar: see Lachower & Tishby 1991

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NOTES

EPIGRAPH

1 Penfield 1965–6.

2 Plotinus (third century AD), *Enneads*, Bk VI, Tractate IV, §14.

INTRODUCTION

1 Wittgenstein 1984 (54e).

2 This myth is best known in the West from Goethe's poem 'Der Zauberlehrling'. The magus is overheard by his apprentice casting a spell; the apprentice tries it himself when his master is away, getting the broom and bucket to fetch water for him, and is delighted with his newfound power – until he finds that though he could set things in motion, he has no way of stopping them again. The magus returns and casts a spell just in time to save his apprentice from drowning. So fundamental is this myth to the experience of being human that it exists in one form or another in almost every society that has been studied across five continents (Thompson 1946).

3 Schrödinger 1951 (5). Rather more movingly, Plotinus writes: ἡμεῖς δέ – τίνας δὲ ἡμεῖς; 'But we – who *are* we?' (see epigraph).

4 Jonas 2001 (196).

5 Waismann 1968 (33).

6 Maudlin 1998.

7 Henry 2005.

8 Waismann 1968 (20).

9 Plato, *Epistles*, VII, 341c (trans J Harward).

10 Yeats, 'Among schoolchildren'.

11 Heschel 1997 (176): 'In the eyes of him whose first category is the category of quantity, one man is less than two men, but in the eyes of God one life is worth as much as all of life'.

12 The illustration here is adapted from a helpful analogy provided by Jan Zwicky (personal communication), and recapitulates a point made by Wittgenstein in *Philosophical Investigations*.

13 Thus Harold Bloom (2003, 12) says of Shakespeare that he was 'a consciousness shaped by all the consciousnesses that he imagined' and 'his consciousness can seem more the product of his art than its producer'. In a similar vein, Aaron Copland says that 'the reason for the compulsion to renewed creativity, it seems to me, is that each added work brings with it an element of self-discovery. I must create in order to know myself ...' (Copland 1952, 41).

14 Fichte 1991 (90).

15 Lavelle 1939, ch 9, §7: « *La charité est ... une pure attention à l'existence d'autrui.* »

16 One demonstration of how blind we can be to the obvious forms the basis of a particularly ingenious clip, featuring Agatha Christie's detective Hercule Poirot, which was a successful cycling safety ad for Transport for London, with over 9 million hits on YouTube: www.youtube.com/watch?v=ubNF9QNEQLA (accessed 23 February 2021)

17 With one exception: the global/local distinction, in support of which I here do cite the research. This is because it is of central importance, and I understated the evidence base in *The Master and his Emissary*: there can be no room for scepticism here.

18 The four main theories are these: (1) facilitation of avoidance behaviour: eg, a threat from the right half of space causes the salamander *Amblystoma* to coil away from it, which requires an instant response by left-sided musculature – see, eg, Bullock & Horridge 1965, vol 1, 57–8, and Sarnat & Netsky 1981; (2) reversal of optical imagery: optical imagery being both vertically and *horizontally* reversed, decussation yields 'close central association between the primary visual inputs from the

hemispace and the central somatic centres subserving the hemibody oriented to the visual hemispace’ – the retina is embryologically part of the brain (Ramón y Cajal 1899; see also Capozzoli 1995); (3) information processing: ‘as the number of wiring connections grows, decussated arrangements become overwhelmingly more robust against wiring errors than seemingly simpler same-sided wiring schemes’ (Shinbrot & Young 2008); and (4) axial rotation in the development of vertebrates, the idea being that the relocation of the neuraxis from the ventral to the dorsal aspect of the body proceeded by means of a twisting of the body 180 degrees on its axis just behind its anterior pole (Kinsbourne 2013). But, as I say, no-one ultimately can be sure, and nothing hangs on it, with regard to the message of this book, either way.

19 Even the neonate is very far from being a blank slate.

20 Mills, Alwatban, Hage *et al* 2017 (1299).

21 Goebel, Linden, Sireteanu *et al* 1997.

22 See McGilchrist 2009b (26–7), for discussion and supporting evidence.

23 Barth, Miklosi, Watkins *et al* 2005.

24 Jozet-Alves, Viblanc, Romagny *et al* 2012; Schnell, Hanlon, Benkada *et al* 2016.

25 Frasnelli, Vallortigara & Rogers 2012.

26 Byrne, Kuba & Griebel 2002.

27 Frasnelli, Anfora, Trona *et al* 2010; Rigosi, Haase, Rath *et al* 2015.

28 Frasnelli, Iakovlev & Reznikova 2012.

29 Ades & Ramires, 2002; Heuts & Lambrechts 1999.

30 Matsuo, Kawaguchi, Yamagishi *et al* 2010.

31 Babcock & Robison 1989.

32 Hobert, Johnston & Chang 2002; Taylor, Hsieh, Gamse *et al* 2010.

33 Güntürkün & Ocklenburg 2017.

34 Bonati, Csermely & Sovrano 2013a.

35 Bonati & Csermely 2011.

36 Bonati, Csermely & Sovrano 2013b.

37 Rogers, Zucca & Vallortigara 2004.

38 Dharmaretnam & Rogers 2005.

39 Hunt 2000; Hunt, Corballis & Gray 2001; Hunt & Gray 2004; Rutledge & Hunt 2004.

40 See McGilchrist 2009b, esp Chapter 2.

41 For example, thinking about animals deemed to be more highly ‘predacious’ selectively activates a network in the right superior temporal lobe in humans (Connolly, Sha, Guntupalli *et al* 2016).

42 Abu-Rustum, Ziade & Abu-Rustum 2013.

43 Amunts 2010; Thurman 1866; Crichton-Browne 1880; Bonin 1962; Hadžiselimović & Čuš 1966; Galaburda, LeMay, Kemper *et al* 1978; Weis, Haug, Holoubek *et al* 1989; LeMay 1982; Schwartz, Creasey, Grady *et al* 1985; Kertesz, Polk, Black *et al* 1992; Zilles, Dabringhaus, Geyer *et al* 1996; Damasio 2005 (82); Wang, He, Tong *et al* 1999 (at least in Caucasians and East Asians); Giedd, Snell, Lange *et al* 1996.

44 François Magendie: « *les deux lobes ne présentent jamais le même arrangement dans leurs circonvolutions* », in Bichat 1822 (19, n1). See also Galaburda 1995; Chiarello, Vazquez, Felton *et al* 2016

[45](#) Galaburda, Aboitiz, Rosen *et al* 1986; Pakkenberg & Gundersen 1997 (number of neurones here estimated as 0.0086% greater in LH).

[46](#) Jenner, Rosen & Galaburda 1999; Amunts, Schleicher, Bürgel *et al* 1999; Amunts, Jäncke, Mohlberg *et al* 2000.

[47](#) Hutsler & Gazzaniga 1996.

[48](#) Seldon 1981.

[49](#) Gur, Packer, Hungerbühler *et al* 1980.

[50](#) Glick, Ross & Hough 1982; Reynolds 1983; Tucker & Williamson 1984; Matthysse 1978; Toga & Thompson 2003; Oke, Keller, Mefford *et al* 1978; Wagner, Burns, Dannals *et al* 1983; Fride & Weinstock 1988; Wittling & Pflüger 1990.

[51](#) Commissurotomy (or callosotomy) is the procedure for severing the corpus callosum, producing a so-called split brain. This was a revolutionary operation pioneered in California in the 1960s for the treatment of subjects with intractable epilepsy, since it prevented a storm of abnormal electrical activity in one hemisphere spreading to the whole brain. It also gave psychologists an unparalleled opportunity to investigate one hemisphere at a time. As the contemporary neuroscientist Stanislas Dehaene puts it: 'Patients with a severed corpus callosum are a gold mine for neuropsychologists because they allow for a systematic assessment of the cognitive abilities available in each hemisphere' (Dehaene 1997, 182).

[52](#) Noë 2011.

[53](#) See McGilchrist 2009b (22–31, 42–8, 111–5 *et passim*).

[54](#) See McGilchrist 2009b (37–40, 43–5, 83, 178–9). See also, eg, Brown & Kosslyn 1993; Çiçek, Gitelman, Hurley *et al* 2007; Delis, Robertson & Efron 1986; Delis, Kiefner & Fridlund 1988; Deouell, Ivry & Knight 2003; Dimond 1979a; Dimond 1979b; Fink, Halligan, Marshall *et al* 1996; Gable, Poole & Cook 2013; Halligan & Marshall 1994; Heinze & Münte 1993; Heinze, Hinrichs, Scholz *et al* 1998; Hoff & Pözl 1935a; Hübner 1998; Ivry & Robertson 1998; Jackson, Hobman, Jimmieson *et al* 2012; Jerison 1977; Jiang & Han 2005; Kitterle & Selig 1991; Kitterle, Christman & Hellige 1990; Lamb, Robertson & Knight 1990; Leclercq 2002 (16); Malinowski, Hübner, Keil *et al* 2002; Martin 1979; Martinez, Moses, Frank *et al* 1997; Mesulam 2000a; Navon 1977; Posner & Petersen 1990; Posner 1995; Poynter & Roberts 2012; Proverbio, Minniti & Zani 1998; Robertson & Lamb 1991; Robertson, Lamb & Knight 1988; Rousseaux, Fimm & Cantagallo 2002; Sergent 1982b; Siéoff 1990; Siéoff 1994; Siéoff, Decaix, Chokron *et al* 2007; Sturm, Fimm, Cantagallo *et al* 2002 (370); van Kleeck 1989; Volberg & Hübner 2004; Yamaguchi, Yamagata & Kobayashi 2000. In an anticipated crossover finding, in left-handers the laterality of global/local effects may be reversed (Mevorach, Humphreys & Shalev 2005).

[55](#) Sanders & Poeppel 2006. It is amusing that this testimony comes from one of the only papers in a vast literature that failed to find the difference to which they attest. For an explanation of why they failed, see McGilchrist 2019.

[56](#) Mills, Alwatban, Hage *et al* 2017. Cf Velichkovsky, Korosteleva, Pannasch *et al* 2019: 'Although there has been interest in *intra*hemispheric differences between the dorsal and ventral visual systems, this is not in conflict with the *inter*hemispheric differences, especially since the 'activated structures of the dorsal pathway were localized in the right hemisphere and those of the ventral stream mainly – albeit not exclusively – in the left hemisphere'.

[57](#) See McGilchrist 2009b (40, 56, 94, 163–4, 172–3). Also Ramachandran 1994.

[58](#) See McGilchrist *op cit* (78–83).

[59](#) See *op cit* (46–9).

[60](#) See *op cit* (76–7, 88, 137).

- 61** See *op cit* (49–51, 70–3, 82, 90, 99, 125, 141, 174–195, 200, 207–9, 224).
- 62** See *op cit* (55–6).
- 63** See *op cit* (59, 70–6, 81, 88–9, 189–91).
- 64** See *op cit* (27, 52).
- 65** See *op cit* (50–6, 63, 77, 80–1, 112, 191, 195).
- 66** See *op cit* (51, 55–69).
- 67** See *op cit* (49, 51, 59–61, 70–1, 90, 99–110 *et passim*).
- 68** See *op cit* (72–5. Professional musicians may differ from this pattern: see *op cit*, 75).
- 69** See *op cit* (57–8, 108, 472).
- 70** See *op cit* (28, 55–63, 72, 85–8, 90, 108, 122–8, 149 *et passim*).
- 71** See *op cit* (58–64).
- 72** See *op cit* (50–6, 70, 93, 152, 163–4, 179, 191–7).
- 73** See *op cit* (84–7, 131, 234–7).
- 74** See Kavcic, Fei, Hu *et al* 2000 (81), who pinpoint the tectum of the midbrain: ‘The tonic and/or phasic status of the several modulatory systems of the brainstem seem fully capable of apportioning their effects to favour one or the other hemisphere in gaining ascendancy in metacontrol ... The superior colliculus seems a likely focal point for such interhemispheric effects’. Jack Pettigrew has researched the phenomenon extensively, and his conclusions are argued for at some length in an interesting paper (Pettigrew 2001). He locates the ‘switch’ in the tegmentum (ventral tegmental area, or VTA), rather than the tectum, but still in the midbrain.
- 75** See, eg, Shermer 2008; Guye, Bettus, Bartolomei *et al* 2010; Bullmore & Sporns 2009.
- 76** See, eg, Swanson, Sporns & Hahn 2016; Friedman & Polson 1981; Hellige, Cox & Litvac 1979; Bisiacchi, Marzi, Nicoletti *et al* 1994; Chiarello & Maxfield 1996; Gee, Biswal, Kelly *et al* 2011.
- 77** Annett 2002.
- 78** Zaidel, Iacoboni, Zaidel *et al* 2003 (388). See also Iacoboni, Rayman & Zaidel 1996; and, for another point of view, MacKay & MacKay 1982.
- 79** Sperry 1973 (211–2): referring to Gazzaniga 1965. See also Gazzaniga, Bogen & Sperry 1967; Levy 1969a; Gordon & Sperry 1969; Levy, Trevarthen & Sperry 1972; Milner & Taylor 1971; Nebes 1971; Nebes & Sperry 1971; Sperry 1968; Sperry, Gazzaniga & Bogen 1969.
- 80** Sperry 1973 (213), referring to Sperry 1970, ch vii (48).
- 81** Bogen 1985 (38: emphasis added).
- 82** Sperry 1985.
- 83** Gazzaniga 1998.
- 84** As quoted in *Die Zeit*, 13th June 2013: » *Ich glaube, dass McGilchrist auf einer tiefen Ebene recht hat. In den Hemisphären mit ihren unterschiedlichen Komponenten und Fähigkeiten stecken unterschiedliche Persönlichkeitsschwerpunkte* «.
- 85** Braun & Suffren 2011.
- 86** See Roland Puccetti (1989): ‘Those sceptics about mental duality who give the safe rejoinder that it is ablation of the forebrain commissures which creates double mindedness in patients manifesting the disconnection syndrome, so that its symptoms tell us nothing about the organization of consciousness in normal subjects, must ask themselves how it is possible one half of a formerly healthy (except for proneness to epileptic seizures in many cases) brain – the half that does not even think in language – should be able to perform transparently intentional and purposeful acts ... Such

acts require, at the very least, memory, foresight, and anticipation of probable responses from the dominant, speaking hemisphere. Did these characteristically human psychological capacities arise *de novo* from the disconnection, or were they not previously present but suppressed by the unconscious inhibitory influence of the speech hemisphere, acting through the intact corpus callosum? The latter seem a far more parsimonious explanation of the behaviour Bogen has described.'

87 Whitehead 1929b (71).

88 Whitehead 1929b (56–8).

89 See McGilchrist 2009b (47).

90 Saron & Davidson 1989; Braun 1992; Moes, Brown & Minnema 2007; Marzi 2010; Marzi, Bisiacchi & Nicoletti 1991.

91 Gotts, Jo, Wallace *et al* 2013.

92 *Pirkei Avot* (an ancient compilation of the teachings of the Rabbis of the Mishnaic period, commonly known in English as *The Chapters of the Fathers*), §2:21.

93 Shelley 1921 (56).

94 James 1897, 'Is life worth living?': 32–62 (54).

95 Mallarmé, 'Le mystère dans les lettres', 1896.

96 Gleiser 2014 (xxii).

97 Quoted in Pugh 1978 (154).

1. SOME PRELIMINARIES: HOW WE GOT HERE

1 Voltaire, 'Le Mondain', 1736: 'the superfluous, that very necessary thing, has reunited the hemispheres'. Of course Voltaire was not speaking of neurology, but of the coming together, through trading items of luxury, of the Western and Eastern hemispheres; but it has a curious aptness here.

2 Sperry 1952.

3 Watanabe, Kuhn, Fushiki *et al* 2014. I am grateful to Professor Martin Rossor for drawing this to my attention.

4 Ulinski 1990; Rowe, Macrini & Luo 2011; Luzzati 2015.

5 Hulbert 1988.

6 Rowe *et al*, *op cit*.

7 Luo, Ruf, Schultz *et al* 2011.

8 Iwamura 2000.

9 Ten Donkelaar 1998.

10 Aboitiz & Montiel 2003.

11 Aboitiz 1999; Aboitiz, Morales & Montiel 2001.

12 Eg, Aboitiz & Montiel 2003.

13 Milleret & Houzel 2001; Houzel, Carvalho & Lent 2002; Aboitiz & Ide 1998; Mhrshahi 2006.

14 Abbie 1939.

15 Schüz & Preißl 1996.

16 Ringo, Doty, Demeter *et al* 1994.

17 Ringo 1991.

18 Uylings & van Eden 1990.

19 Van Essen & Maunsell 1983; Maunsell & Newsome 1987.

20 Spinelli, Starr & Barrett 1968; Fishman & Michael 1973; Ringo *op cit*.

21 Campos & Welker 1976; Kaas 1987.

22 Schüz & Preißl 1996.

23 Bloom & Hynd 2005; van der Knaap & van der Ham 2011; Clarke & Zaidel 1994; Nowicka & Tacikowski 2011; Denenberg 1983.

24 For an overview, see van der Knaap *et al*, *op cit*. See also Innocenti 1980; Innocenti 1986; Kawaguchi 1992; Meyer, Röricht, von Einsiedel *et al* 1995; Röricht, Irlbacher, Petrow *et al* 1997; Höppner, Kunesch, Buchmann *et al* 1999; Saron, Foxe, Schroeder *et al* 2003; Allison, Meador, Loring *et al* 2000; Tootell, Mendola, Hadjikhani *et al* 1998; Conti & Manzoni 1994; Saron, Foxe, Simpson *et al* 2002; McGilchrist 2009b (17–19).

25 Olivares, Montiel & Aboitiz 2001; Nowicka & Tacikowski 2011.

26 Milleret & Houzel 2001. Intriguingly, among these, it is inhibitory neurones within the callosum that are faster, thicker and myelinate earlier in development. This may have to do with the all-important ability to separate figure from ground – see Knyazeva 2013; Makarov, Schmidt, Castellanos *et al* 2008.

- 27** Nowicka & Tacikowski 2011; Hofer, Merboldt, Tammer *et al* 2008; Aboitiz & Montiel 2003; Lamantia & Rakic 1990; Aboitiz 1992; Aboitiz, Scheibel, Fisher *et al* 1992; Aboitiz, López & Montiel 2003; Schüz & Preißl 1996.
- 28** Hofer, Merboldt, Tammer *et al* 2008; Aboitiz & Montiel 2003; Lamantia & Rakic 1990; Aboitiz 1992; Aboitiz, Scheibel, Fisher *et al* 1992; Aboitiz, López & Montiel 2003; Schüz & Preißl 1996.
- 29** Stark, Margulies, Shehzad *et al* 2008; Chiarello & Maxfield 1996; Kosslyn, Chabris, Marsolek *et al* 1992; Liederman & Meehan 1986.
- 30** Nowicka & Tacikowski 2011; Gee, Biswal, Kelly *et al* 2011; Hamzei, Dettmers, Rzanny *et al* 2002; Pal, Hanajima, Gunraj *et al* 2005; Reis, Swayne, Vandermeeren *et al* 2008.
- 31** Hendry, Schwark, Jones *et al* 1987.
- 32** Ramón y Cajal 2002; Rakic 2009; DeFelipe 2002; Jones 2009.
- 33** Semendeferi & Horton 2015 (8); DeFelipe 2002; Rakic 2009.
- 34** Hendry, Schwark, Jones *et al* 1987; Jones 2009.
- 35** Sanchez 1990 (33).
- 36** Rilling & Insel 1999.
- 37** Langan, Peltier, Bo *et al* 2010; Cabeza 2002.
- 38** Banich & Belger 1990; Dimond & Beaumont 1971; Holtzman & Gazzaniga 1985; Hoptman & Davidson 1994.
- 39** Holtzman *et al*, *op cit*; Ellenberg & Sperry 1979.
- 40** Dimond *et al*, *op cit*; Banich *et al*, *op cit*.
- 41** Liederman 1986.
- 42** Luck, Hillyard, Mangun *et al* 1989; Arguin, Lassonde, Quattrini *et al* 2000.
- 43** Ellenberg & Sperry 1979.
- 44** Merola & Liederman 1985.
- 45** Bitan, Lifshitz, Breznitz *et al* 2010.
- 46** Gotts, Jo, Wallace *et al* 2013.
- 47** Levy 1985.
- 48** Zaidel, Clarke & Suyenbu 1990.
- 49** Cook 1984a, 1984b.
- 50** Bianki 1993.
- 51** Karbe, Herholz, Halber *et al* 1998; Nowicka & Tacikowski 2011; Saron, Foxe, Schroeder *et al* 2003; Allison, Meador, Loring *et al* 2000; Tootell, Mendola, Hadjikhani *et al* 1998.
- 52** The difference between presence in the right hemisphere and re-presentation in the left is at the core of this phenomenon. See Seger, Poldrack, Prabhakaran *et al* 2000: ‘In the present study [of visual concept learning], the right hemisphere frontal and parietal activations were present from the beginning and persisted throughout learning. They did not differ reliably in learners and non-learners. Thus, the right hemisphere activations appear to be related to constant processes of visuo-spatial analysis of *stimulus specifics that are dissociable from categorical learning*. Indeed, such right hemisphere processes would have to be insulated from categorical knowledge in order to maintain their focus on stimulus-specific properties, and it is to be expected that this focus would be maintained across the task. Left-hemisphere activation occurred as participants learned abstract categories applicable to the specific stimuli ...’ (1323: emphasis added).

53 Braun 2007; Braun, Delisle, Guimond *et al* 2009; Braun, Dumont, Duval *et al* 2003.

54 See McGilchrist 2009b (218–9).

55 Naeser, Martin, Ho *et al* 2012. Similar findings from using TMS to disrupt the brain area contralateral to a lesion have been found for other regions of the brain. See, eg, Hilgetag, Theoret & Pascual-Leone 2001; Oliveri, Rossini, Filippi *et al* 2000.

56 Funk & Pettigrew 2003.

57 Gotts, Jo, Wallace *et al* 1989; Braun 1992; Moes, Brown & Minnema 2007; Marzi 2010; Marzi, Bisiacchi & Nicoletti 1991; Nowicka & Tacikowski 2011; Barnett & Corballis 2005; Larson & Brown 1997.

58 Medvedev 2014; Thatcher, Biver & North 2007; Tucker, Roth & Bair 1986; Voineskos, Farzan, Barr *et al* 2010; Jalili 2014.

59 Medvedev 2014. See also, eg, Kinsbourne 1974.

60 Olivares, Michalland & Aboitiz 2000; Olivares, Montiel & Aboitiz 2001; Nowicka & Tacikowski 2011.

61 Dorion, Chantôme, Hasboun *et al* 2000; Nowicka *et al*, *op cit*.

62 Nowicka *et al*, *op cit*.

63 Rilling & Insel 1999; Nowicka *et al*, *op cit*.

64 Tapp, Siwak, Gao *et al* 2004; Semendeferi, Lu, Schenker *et al* 2002. The percentages given for dogs and monkeys in *The Master and his Emissary* (20–1) are significant underestimates, the source of which I cannot now trace, and for which I apologise, above all to dogs and monkeys.

65 Sperry 1973 (215, 220); Levy 1969b.

66 Sperry *op cit* (214).

67 See McGilchrist 2009b *passim*, and esp Chapter 6: ‘The triumph of the left hemisphere’.

2. ATTENTION

1 Tarnas 2006 (16).

2 Thoreau 1906, vol 2 (373): journal entry for 5 August 1851.

3 Blake, letter to the Revd John Trusler, 23 August 1799.

4 Hillis & Tippet 2014.

5 Right hemisphere and attention in general: see, eg, Heilman & van den Abell 1980; Shulman, Pope, Astafiev *et al* 2010; Longo, Trippier, Vagnoni *et al* 2015; Valsangkar-Smyth, Donovan, Sinnott *et al* 2004; Kingstone 2016; Petit, Simon, Joliot *et al* 2007. Right hemisphere and switching attention: Okada, Sato, Kubota *et al* 2012; Okada, Sato & Toichi 2006; Verleger, Sprenger, Gebauer *et al* 2009; Hodgson, Chamberlain, Parris *et al* 2007.

6 Flöel, Buyx, Breitenstein *et al* 2005; Mevorach, Humphreys & Shalev 2005. When both global attention and language lateralise, unusually, *in the same direction* (more commonly in left- or mixed-handers), it is commoner for language to lateralise, along with attention, to the right hemisphere than for attention to lateralise, along with language, to the left hemisphere. Thus the association between the right hemisphere and global attention is the ‘last to go’. All patterns can, however – if rarely – be found. On language lateralisation in left-handers, see Pujol, Deus, Losilla *et al* 1999.

7 See, eg, Posner & Petersen 1990; R Whitehead 1991; Husain & Rorden 2003; Malhotra, Coulthard & Husain 2009; Sturm & Willmes 2001; Lewin, Friedman, Wu *et al* 1996; Pardo, Fox & Raichle 1991; Sturm, de Simone, Krause *et al* 1999; Jerison 1977; Dimond 1979a; Rueckert & Grafman 1996; Wilkins, Shallice & McCarthy 1987; and see McGilchrist 2009b (37–45 *et passim*).

8 Koski & Petrides 2001.

9 Sack, Camprodon, Pascual-Leone *et al* 2005; Mihov, Denzler & Förster 2010; Luck, Hillyard, Mangun *et al* 1989; Luck, Hillyard, Mangun *et al* 1994; Cronin-Golomb 1986.

10 Halligan & Marshall 1998 (378).

11 Somers & Sheremata 2013. More specifically, with increasing attentional load, principally a region in the right parietal lobe and part of the thalamus (the pulvinar) show greater activity (Hopfinger, Woldorff, Fletcher *et al* 2001). (*Pulvinar* is the Latin word for ‘cushion’, from its appearance, and our word ‘pillow’ comes from it).

12 *ibid.*

13 Dimond 1979b.

14 Dimond 1976; Dimond 1979d.

15 Dimond 1976.

16 Dimond 1979d.

17 Simons & Chabris 1999.

18 Vos & Whitman 2014.

19 Simons & Levin 1998. This was the original academic study. More dramatic instances have been engineered by, for example, the illusionist Derren Brown: www.wimp.com/person-swapping-social-experiment-by-derren-brown/ (accessed 3 November 2017).

20 Boeschoten, Kemner, Kenemans *et al* 2005; Kenemans, Baas, Mangun *et al* 2000; first noted by Lange (1936).

21 A vivid demonstration of this phenomenon in a dog following a right hemisphere stroke is available on YouTube: www.youtube.com/watch?v=hHo-y7WJIU.

22 Bareham, Bekinschtein, Scott *et al* 2015. See also, eg, Mosidze, Mkheidze & Makashvili 1994 (74 out of 150 patients with RH damage, 1 out of 100 patients with LH damage); Binder, Marshall, Lazar *et al* 1992; Kleinman, Sepkuty, Hillis *et al* 2007; Farne, Buxbaum, Ferraro *et al* 2004; Becker & Karnath 2007; and Bowen, McKenna & Tallis 1999. In right hemisphere-damaged patients, estimates of neglect range from 48% (Buxbaum, Ferraro, Veramonti *et al* 2004) to 82% (Stone, Halligan, Greenwood *et al* 1993), and approaching 100% where more sensitive measures are applied: Mario Bonato and colleagues ‘detected severe awareness deficits’ in right hemisphere-damaged patients, where the usual cancellation tests failed to reveal one (Bonato, Priftis, Umiltà *et al* 2013). Although Stone and colleagues (*vid sup*) found up to 65% of *left* hemisphere-damaged patients to display some form of neglect immediately after the stroke, a subsequent review concluded that ‘only right hemisphere lesions cause severe and persistent deficits’ (Corbetta & Shulman 2011). For an unusual case report of right hemineglect, see Peru, Leder & Aglioti 2000: the first (cortical) stroke in the left occipital lobe did not induce neglect; a second, left capsulo-thalamic (subcortical) stroke, however, did.

23 Adair, Na, Schwartz *et al* 2003; Rubens 1985.

24 Bellas, Novelly, Eskenazi *et al* 1988b; Schwartz, Marchok & Flynn 1977; Schwartz, Marchok, Kreinick *et al* 1979; Heldmann, Kerkhoff, Struppler *et al* 2000.

25 Royet & Plailly 2004.

26 Bellas, Novelly, Eskenazi *et al* 1988a. The authors distinguish between what they call a sensory model and a ‘representational’ model, using the conventional terminology which suggests that the world is ‘represented’ rather than ‘presences’ to us, but that is a metaphysical point that is irrelevant to the value of empirical data here.

27 Ellis, Jordan & Sullivan 2006.

28 Eg, left hemisphere stimulation impairs performance on the Wisconsin Card Sorting Test, a classic test of the ability to shift mental set, highly dependent on frontal, but especially right frontal, functioning (Lueken, Schwarz, Hertel *et al* 2008).

29 De Renzi (1988) called this magnetic attraction of gaze ‘peeking’, and identified it in 17 patients, 13 of whom had right brain damage. See also Morrow & Ratcliff 1988; Rastelli, Funes, Lupiáñez *et al* 2008; Posner, Walker, Friedrich *et al* 1984; Gainotti, D’Erme & Bartolomeo 1991; Bourgeois, Chica, Migliaccio *et al* 2015.

30 Cutting 1997 (114); Unnithan, David & Cutting 1991.

31 Hornak 1992; Karnath & Fetter 1995; Karnath & Rorden 2012.

32 Husain, Shapiro, Martin *et al* 1997; Rizzo, Akutsu & Dawson 2001.

33 Cheung, Chen, Chen *et al* 2002.

34 For discussion of its (de)merits, see McGilchrist 2009b (110). Benjamin Lee Whorf, described by Geoffrey Pullum, Professor of Linguistics at Edinburgh University, as ‘Connecticut fire prevention inspector and weekend language-fancier’, was responsible for starting what Pullum, in a highly entertaining account of its history, calls the ‘great Eskimo vocabulary hoax’, which started by claiming (wrongly, according to Pullum) that Eskimos have seven words for snow, a tally which escalated to 100 in its continuous retelling over the next 50 years (Pullum 1989). Roberson & Davidoff argue for a modified version of the Sapir-Whorf hypothesis, namely that language *influences*, rather than determines, our perception (Roberson & Davidoff 2000; see also Kay & Kempton 1984). Some have argued against even that modified version (Heider 1972; Franklin,

Clifford, Williamson *et al* 2005). An interesting sidelight on the issue is offered by Lindsey & Brown 2002.

35 Gilbert, Regier, Kay *et al* 2006.

36 Kerkhoff 1999 (103). I first found this referred to in a paper by Becchio & Bertone (2005), but their rendering of the German original into English was somewhat impressionistic, so I have attempted a more faithful version.

37 Halligan & Marshall 1998, as cited in Becchio & Bertone 2005.

38 This right hemisphere faculty is already present in chicks (Corballis, Fendrich, Shapley *et al* 1999).

39 ‘Case II’, from Zingerle 1913a (22–4: emphasis in the original): » *Die Stimmung war öfters reizbar, ungeduldig, im allgemeinen aber heiter, zum Witzeln geneigt. Dies stand in Übereinstimmung damit, daß er merkwürdigerweise niemals von seiner Lähmung sprach, diese gar nicht beachtete, und auch gar kein Unbehagen wegen seiner Unbehilflichkeit äußerte. Er hatte für seine linke Körperseite keine Aufmerksamkeit, vermißte dieselbe auffälligerweise gar nicht und schien sie überhaupt vergessen zu haben. Selbst wenn er auf dieselbe aufmerksam gemacht wurde, betrachtete er z. B. den Arm wohl momentan, beschäftigte sich aber nicht weiter damit und fing sofort von etwas anderem zu reden an. Er wußte auch sicher, daß jeder Mensch eine linke und rechte Seite habe, wendete dies aber nicht für sich an ... versagte er plötzlich, und es zeigte sich weitgehende Ratlosigkeit, wenn man von seiner linken Körperseite zu sprechen anfang, darüber eine Auskunft verlangte. Er wurde verlegen, gebrauchte Ausflüchte, verstummte, wurde unaufmerksam, und es war auch erfolglos, ihm die früheren Erinnerungen an die linke Seite zu wecken. Dasselbe wiederholte sich, wenn ihm der Arzt an seinem eigenen Körper die linke Seite demonstrierte. Er kannte dieselbe: dieses Wissen war aber für seine Person ganz belanglos und in keiner Weise klärend. Drang man energischer in ihn, suchte man den Widerspruch zwischen seiner Fremdempfindung und der Wirklichkeit durch Belehrung, Hinlenkung der Augen ihm deutlich zu machen, wurde er immer unruhiger, und ein Verständnisseinerseits war ganz ausgeschlossen, eine Verständigung unmöglich. Es fiel ihm das Ungewöhnliche und Sinnlose gar nicht auf, daß er nur eine rechte Hälfte haben sollte ... Der Pat. hat nicht nur die Empfindung seiner linken Körperseite verloren und weiß von seiner Lähmung nichts, er hat auch ... die Erinnerung an seine linke Körperseite eingebüßt, es ist ihm also neben der Empfindung auch das frühere Wissen an seine linke Seite abhanden gekommen ... seinem Bewußtsein beschränkte sich die Vorstellung des Körpers anscheinend auf die rechte Hälfte, ohne Erinnerung dafür, daß dies früher anders war «.*

40 ‘Case III’ from Zingerle 1913b (31–2: emphasis in original): » *Der Pat[ient] zeigte ein Gebaren, das allen, die bei der Untersuchung anwesend waren, in hohem Grade auffiel. Während er, wie schon erwähnt, dem Gespräche trotz seiner Erkrankung mit angespannter Aufmerksamkeit folgte ... trat eine sofortige Änderung ein, wenn man vom Pat. etwas mit seiner linken Körperseite verlangte oder auch nur von derselben sprach. Ganz unvermittelt bot der Kranke dabei das Bild der schwersten Stumpfheit. Er sah ohne Zeichen einer aktiven Aufmerksamkeit vor sich hin, reagierte in keiner Weise, als ob er nicht hörte, oder nicht verstünde, was man wolle ... Der Kranke, der auch rasch über seine sonstigen Empfindungen Aufschluß gehen konnte, war auch nicht mit einem Worte zu bewegen, sich über seine linke Seite zu äußern, oder seine Empfindungen zu schildern. Auch dringendes, durch Schütteln unterstütztes Fragen scheiterte an der vollkommenen Ablehnung des Kranken. Es war einfach aus dem momentan gerade noch gesprächigen und aufmerksamen Pat. nichts herauszubringen ... Während er in Bezug auf seine rechte Körperseite sich wie ein ganz Normaler benahm, über dieselbe entsprechend verfügte und alle auf dieselben bezüglichen Reize und Fragen entsprechend verarbeitete, schien die linke Körperseite für ihn nicht zu existieren... «.*

41 Bisiach 1993.

42 Bisiach & Luzzatti 1978.

[43](#) Becchio & Bertone 2005

[44](#) Eg, Hayashi & Ivry 2020; but see discussion below.

[45](#) Kosillo & Smith 2010; Lewis & Miall 2006; Ferrandez, Hugueville, Lehericy *et al* 2003; Rao, Mayer & Harrington 2001; Brunia & Damen 1988.

[46](#) Kagerer, Wittmann, Szélag *et al* 2002. The literature on the appreciation of short sound intervals is evenly divided between those that show a right hemisphere- and those that show a left hemisphere-superiority, according to the survey by Brancucci and colleagues (Brancucci, D'Anselmo, Martello *et al* 2008). However, there is a fairly consistent tendency to show that the left hemisphere is superior for very short sounds (whether in speech or music), such as help discriminate consonants (Johnsrude, Zatorre, Milner *et al* 1997; Molfese 1984; Poeppel 2003).

[47](#) Danckert, Ferber, Pun *et al* 2007: 'these findings suggest a pivotal role for a right hemisphere frontoparietal network in the accurate perception of multi-second durations.' See also Merrifield, Hurwitz & Danckert 2010; Allman, Teki, Griffiths *et al* 2014.

[48](#) Danckert & Allman 2005.

[49](#) Koch, Oliveri, Carlesimo *et al* 2002.

[50](#) Harrington, Haaland & Knight 1998.

[51](#) Coull, Vidal, Nazarian *et al* 2004.

[52](#) McGilchrist, Wolkind & Lishman 1994. Tourette's syndrome is a neurodevelopmental disorder characterised by multiple motor and often vocal tics.

[53](#) The typical pattern in Tourette's patients of intact verbal function with impairments in non-verbal function appears to be due to right hemisphere deficits (Bornstein, King & Carroll 1983; Sandyk 1995). And like right hemisphere-damaged patients, they bisect lines to the right of centre (Sheppard, Bradshaw & Mattingley 2002).

[54](#) Meck 2005. See also Drane, Lee, Loring *et al* 1999.

[55](#) Cutting 1997 (207).

[56](#) Cutting 2011 (174). *Zeitstillstand*, whereby time 'stands still' or ceases to exist, is encountered principally in schizophrenia (*ibid*, 25).

[57](#) Ovsiew 2014.

[58](#) Cummings 1997 (27). See also Bender, Feldman & Sobin 1968; Cummings, Syndulko, Goldberg *et al* 1982; Meadows & Munro 1977; Michel & Troost 1980; Stagno & Gates 1991. One interesting case involved a patient with partial situs inversus, a condition in which right and left sides of the body are reversed (eg, the apex of the heart is on the right, not the left, a sign known as dextrocardia). This man had palinopsia following an abscess in the *left* occipital lobe (Lunardi, Tacconi, Missori *et al* 1991). Situs inversus is often accompanied by reversed Yakovlevian torque (Schuler, Kasprian, Schwartz *et al* 2017); and sometimes by right hemisphere speech (Cohen, Geny, Hermine *et al* 1993; Ihara, Hirata, Fujimaki *et al* 2010). But see also Kennedy, O'Craven, Ticho *et al* 1999.

[59](#) Critchley 1951.

[60](#) Bender 1945.

[61](#) Right hemisphere damage only: right parietal: Sakurai, Kurita, Takeda *et al* 2013; right temporoparietal: Otsuka-Hirota, Yamamoto, Miyashita *et al* 2014; right insular: Griffiths, Rees, Witton *et al* 1997: 'this deficit is analogous to the visual phenomenon of akinetopsia'. Bilateral: posterior cortical: Pelak & Hoyt 2005; temporo-occipital: Hess, Baker & Zihl 1989. The case of 'Bilaterale Affektion beider Okzipitallappen' (the case report has no title as such) demonstrated by Otto Pötzl & Emil Redlich in the *Wiener Klinische Wochenschrift* (1911) is often referred to in this context, but motion-blindness was a tiny part of the many problems the patient presented, and is

mentioned only in passing: ‘If in a darkened room one shows her a strong light-source in slower or faster motion, she seems not to perceive the motion of the object; she describes what she sees as “several lights”’ – » *Lässt man im Dunkelzimmer eine starke Lichtquelle in langsamerer oder schneller Bewegung auf sie wirken, scheint sie die Bewegung des Objekts nicht zu apperzipieren; sie bezeichnet das, was sie sieht, als ‚mehrere Lichter‘* « (518). Given that she had difficulty seeing objects at all, unless they were brightly lit and in strong bright colours, and she had gross problems of attention, as well as orientation in space to acoustic and visual stimuli (as well as word-finding problems), and since also little is known of the exact location of her brain lesions, this case is not in my view a reliable source of information about motion perception. Max Wertheimer, however, attended the same patient and examined and confirmed her difficulty in motion perception (Wertheimer 1912, 246–7, n7).

62 Bender, Feldman & Sobin 1968.

63 Jacobs, Feldman & Bender 1972.

64 Meadows & Munro 1977; Müller, Büttner, Kuhn *et al* 1995.

65 Gersztenkorn & Lee 2015. Abert & Ilse (2010) claimed four cases in the literature were due to left-sided lesions; they also misattributed one left-sided lesion as right-sided (case of Swash 1979), making five – though one of the five had Kartagener’s syndrome, in which lateralisation is inherently abnormal, and so is hard to interpret.

66 Kömpf, Piper, Neundörfer *et al* 1983; Arai, Irie, Akiyama *et al* 2002; and Landis, Cummings, Benson *et al* 1986. This last study may have been excluded because no details of the symptoms are included.

67 Cooper, Joshi, Seenan *et al* 2012. However, at the same time the authors do report a case of a man with a left occipital lesion who for a month saw things ‘jump from one location to another’ in his right visual field.

68 Cutting 2002 (214).

69 Snyder & Chatterjee 2004.

70 Left better than right: Mills & Rollman 1980; Swisher & Hirsh 1972; Carmon & Nachshon 1971; Nicholls 1994; Brown & Nicholls 1997. Right better than left: Husain, Shapiro, Martin *et al* 1997; Battelli, Cavanagh, Intriligator *et al* 2001; Battelli, Pascual-Leone & Cavanagh 2007; Forster, Corballis & Corballis 2000; Funnell, Corballis & Gazzaniga 2003; Handy, Gazzaniga & Ivry 2003.

71 Kosslyn 1987; Hellige & Michimata 1989; Rybash & Hoyer 1992; Laeng 1994; Niebauer 2001; van der Ham & Borst 2011.

72 Jordan 2020. Despite this, he notes that there is ‘an overwhelming lack of consideration for hemispheric differences in studies of the rodent hippocampus’, and that ‘a bilateral model of the hippocampus will be essential for an understanding of this brain region, and perhaps of the brain more widely’. The reader will not be surprised to learn that I concur. See also Maguire, Burgess, Donnett *et al* 1998; Spiers, Burgess, Maguire *et al* 2001.

73 Durnford & Kimura 1971.

74 See Gazzaniga & LeDoux 1978; also McGilchrist 2009b (78–80).

75 Bogen 1969 (‘fig 5b’, detail).

76 Hoff & Pötzl 1935b. They later reported a single case (this time left-handed) with focal damage in the region of the right optic radiation, who showed left-sided disturbances of visual depth (1937b).

77 Nikolaenko, Egorov & Freiman 1997 (emphasis added); Egorov & Nikolaenko 1992; and McGilchrist 2009b (78–80).

78 See McGilchrist 2009b (78–80).

- 79** Grossman 1988; Menshutkin & Nikolaenko 1987.
- 80** Nikolaenko, Egorov & Freiman 1997.
- 81** Ramachandran 1996 (350 n1).
- 82** Nikolaenko, Egorov & Freiman 1997; Nikolaenko 2003; Egorov & Nikolaenko 1992.
- 83** Schaadt, Brandt, Kraft *et al* 2015. Their cases had only right posterior damage, but the reference in the title of the paper is to a description of patient ‘WF’, who suffered from a full loss of 3-D vision following a bilateral posterior head wound caused by a gunshot in the First World War. WF showed a complete lack of stereoscopic vision, and was unable to estimate, or indeed, recognise spatial depth (Holmes & Horrax 1919).
- 84** Gilaie-Dotan, Saygin, Lorenzi *et al* 2013 (emphasis added).
- 85** Grabowska 1983; Benton & Hécaen 1970; Carmon & Bechtoldt 1969; Danta, Hilton & O’Boyle 1978; Fortin, Ptito, Faubert *et al* 2002; Murphy, Leopold, Humphreys *et al* 2016; Bridge 2016 (though here the right hemisphere advantage is limited).
- 86** Gilaie-Dotan, Saygin, Lorenzi *et al* 2013 (emphasis added).
- 87** Hoff & Pötzl 1937a; trans Hoff & Pötzl 1988 (232–3).
- 88** Both patients exhibited clinical signs localising to the right hemisphere, including, in both cases, left hemianopia. One was not examined post mortem, and the lesion could not be demonstrated, while the other showed lesions at post mortem in the right posterior cortex, as well as in the left.
- 89** Hoff & Pötzl 1934: » *Und komisch war es, wenn man zu mir gesprochen hat, da war es immer normales Tempo und ganz klar; da habe ich mich um so mehr gewundert, warum die anderen unter sich so Rekord reden und wie sie es machen zu verstehen* «.
- 90** Ovsiew 2014.
- 91** See also Brown 1985.
- 92** Taylor 2009 (40).
- 93** Pichler 1943: » *wie man sie im Kino bei Zeitlupenaufnahmen in Sportfilmen öfters sehen kann* «.
- 94** Pichler 1943 (451): » *Die Leute, die im Zimmer auf- und abgingen – es handelt sich in der Hauptsache um Schwestern – bewegten sich abnorm rasch hin und her, so dass er sie mit den Augen kaum verfolgen konnte ... d. h. in den paar Tagen, in denen er die Bewegungen so beschleunigt sah, das Gefühl hatte, dass sich die Zeit endlos dehnen würde* «.
- 95** Mullan & Penfield 1959. This case is more complex to assess, because the tumour is likely to cause a right hemisphere deficit, but the same phenomena occurred when the area was *stimulated* at operation and during seizures, which should amplify right hemisphere activity. However, the phenomenology is typical of the left hemisphere, especially as the patient describes what she looked directly at as not just slowed to a standstill, but almost decomposed into its component parts.
- 96** Gilaie-Dotan, Saygin, Lorenzi *et al* 2013.
- 97** Vaina 1989.
- 98** Hess, Baker & Zihl 1989. This is a re-examination of the patient in Zihl, von Cramon & Mai 1983.
- 99** Vaina 1989; Saito, Kanayama & Takahashi 1992.
- 100** Plant, Laxer, Barbaro *et al* 1993.
- 101** Binkofski & Block 1996.
- 102** See McGilchrist 2009b (165–7).
- 103** Weinstein, Kahn, Malitz *et al* 1954 (47).

104 Nathanson, Bergman & Gordon 1952 (384).

105 Bisiach & Luzzatti 1978 (132).

106 Kerkhoff 1999.

107 Babinski 1914. Said to occur in 54% of patients after right hemisphere lesions and 9% of patients after left hemisphere damage (Pia, Neppi-Modona, Ricci *et al* 2004; Feinberg & Roane 2003; Feinberg, Roane & Ali 2000; Feinberg, Roane, Kwan *et al* 1994).

108 Babinski 1914; Critchley 1953 (230).

109 Bruell & Albee 1962.

110 Critchley 1953 (230 ff).

111 Hécaen & de Ajuriaguerra 1952 (187). See also Mesulam, Waxman, Geschwind *et al* 1976.

112 From Prof Dr Jürg Kesselring, Zürich Neuroscience Centre (personal communication).

113 Scheid 1934.

114 Zingerle 1913a (22): » *Dagegen sprach er fortwährend davon, daß links neben ihm jemand, und zwar eine Frau, im Bette liege, wobei er auf seine linke Seite zeigte und war auch durch den Augenschein davon nicht abzubringen. Oft brachte er diese Angabe mit erotischen Witzeleien, streichelte dabei den linken Arm, dann wieder beklagte er sich über die Störung, die ihm besonders nachts dadurch zugefügt werde.* «

115 Similar cases where the paralysed arm belongs to another occupant of the bed have been reported for nearly 200 years, eg, Bouillaud 1825 (64): « *il lui semblait que c'était une autre personne couchée à côté de lui, ou même celui d'un cadavre* ». See also Pötzl 1924; Engerth & Hoff 1929; Lhermitte 1998 (130).

116 Levine & Grek 1984 (emphasis added).

117 Gazzaniga & Miller 2009; Feinberg, Venneri, Simone *et al* 2010; Feinberg & Keenan 2005; Malloy & Richardson 1994; Bruen, McGeown, Shanks *et al* 2008; R Joseph 1986; Belyĭ 1975.

118 Bartolomeo, De Vito & Seidel Malkinson 2017.

119 Gazzaniga 2015.

120 Gazzaniga & LeDoux 1978.

121 Nisbett & Wilson 1977. A fair point is that they may have delayed making a decision till they got to the end of the line, reading left to right in the conventional Western fashion, then seized on whatever they were looking at at the time. But on this see Wilson 2002.

122 However, Vallar & Ronchi, in their review (2009), found 91% of cases to have right-sided pathology.

123 Cappa, Sterzi, Vallar *et al* 1987.

124 Meador, Loring, Feinberg *et al* 2000.

125 In addition to Feinberg's series, see Heydrich, Dieguez, Grunwald *et al* 2010 for two case reports (right posterior intraparietal sulcus and right middle and superior frontal gyrus) and a helpful literature review. See also, for right posterior insula: Baier & Karnath 2008 (11 patients); Cereda, Ghika, Maeder *et al* 2002; Karnath, Baier & Nägele 2005; right posterior insula and right frontal operculum: Tsakiris, Hesse, Boy *et al* 2007; right insula and parietal lobe: Farrer, Franck, Georgieff *et al* 2003; right temporoparietal region: Halligan, Marshall & Wade 1995; right premotor cortex: Arzy, Overney, Landis *et al* 2006; Berti, Bottini, Gandola *et al* 2005; Dieguez, Staub & Bogousslavsky 2005.

126 Hécaen & de Ajuriaguerra 1952 (161): « *'Donnez-moi la main', donne la main droite. 'Donnez-moi l'autre?', retire sa main droite de la main de l'observateur pour la placer dans l'autre main de*

celui-ci. Si on insiste, elle passe ainsi sa main droite d'une main à l'autre sans faire effort pour tendre la main gauche. On lui présente alors la main gauche en lui demandant de quelle main il s'agit, elle répond 'c'est votre main droite.' ».

127 Bisiach, Rusconi & Vallar 1991.

128 Original findings: Bisiach, Rusconi & Vallar 1991; replicated: Rode, Charles, Perenin *et al* 1992; Ramachandran 1996.

129 Ehrenwald 1931 (683): » *Er ... beklagte sich über die Schlamperei der Schwestern, die ihn offenbar mit der Schmutzwäsche zusammen fortgeschafft hätten* «.

130 Ramachandran 1994 (319).

131 Feinberg, Venneri, Simone *et al* 2010.

132 Aglioti, Smania, Manfredi *et al* 1996; Berlucchi & Aglioti 1997.

133 Feinberg, Venneri, Simone *et al* 2010 (277).

134 Coltheart 2007; Vallar & Ronchi 2009.

135 Feinberg, Deluca, Giacino *et al* 2005.

136 Nightingale 1982.

137 See, eg, Lee, Shinbo, Kanai *et al* 2011.

138 Thompson, Silk & Hover 1980.

139 Vörös, Tényi, Simon *et al* 2003.

140 Politis & Loa 2012.

141 Budson, Roth, Rentz *et al* 2000.

142 Kapur, Turner & King 1988; Devinsky 2009; Moser, Cohen, Malloy *et al* 1998; Patterson & Mack 1985; Filley & Jarvis 1987; Alexander, Stuss & Benson 1979; Murai, Toichi, Sengoku *et al* 1997; Hakim, Verma & Greiffenstein 1988; Pluchon, Salmon, Houeto *et al* 2010; Benson, Gardner & Meadows 1976; Likitcharoen & Phanthumchinda 2004; Förstl, Burns, Jacoby *et al* 1991; Hoffmann 2008 (four cases); and Edelstyn & Oyebode 1999. It has been suggested that the novelist Henry James, who in his last illness sustained a right hemisphere stroke, experienced reduplicative paramnesia (Bartolomeo 2013). But this is not clear. Rather he appeared disoriented, a much more common sequela of any cerebral disturbance: 'He said he was in California or in Cork and complained of being told he was actually in London. He expressed the desire to go to his mansion in Rye; afterwards, he believed he was there and commented upon how comfortable and pleasant the place was. In his words, "This place I find myself is the strangest mixture of Edinburgh and Dublin and New York and some other place that I don't know"'. On the other hand, there is evidence that disorientation for place is commoner after right hemisphere damage (Fisher 1982). And he believed he was Napoleon. It would not have pleased James to know that this is (or was) a rather common delusion; but in an engaging and entirely characteristic interpretation of the imperial role, he dictated directions for the redecoration of the Louvre and the Tuileries (Edel 1968).

143 Cutting 2011 (308). See also Förstl, Almeida, Owen *et al* 1991 (a review of 260 cases); Ellis & Szulecka 1996; Bouckoms, Martuza & Henderson 1986; Staff, Venneri, Gemmell *et al* 2000; Diesfeldt & Troost 1995; Horikawa, Monji, Sasaki *et al* 2006; Eren, Çivi & Yıldız 2005.

144 Rojo, Caballero, Iruela *et al* 1991; Reid, Young & Hellawell 1993.

145 Spitzer, Willert, Grabe *et al* 2004: 'These results suggest that the neural basis of dissociation may involve a cortical asymmetry with a left hemispheric superiority or, alternatively, a lack of right hemispheric integration.' See also Schlumpf, Reinders, Nijenhuis *et al* 2014; Sar, Unal & Ozturk 2007.

146 Ito, Yamane, Suzuki *et al* 2017; Unema, Pannasch, Joos *et al* 2005; Velichkovsky, Rothert, Kopf *et al* 2002.

147 Mills, Alwatban, Hage *et al* 2017.

148 Hécaen & de Ajuriaguerra 1952 (229–31).

149 Ehrenwald 1931 (683–4): » *An Stelle der linken Brusthälfte, des Bauches und des Magens, habe man ihm ein Brett eingesetzt. Das ziehe bis an den After hinunter, sei durch Querbretter in Fächer eingeteilt und habe an seiner Unterfläche ein Loch. Die Speisen passieren nicht in der üblichen Weise den Magen und den Darm, sie werden in die Fächer der Stellage eingepumpt und verlassen sie durch das Loch am Boden der Stellage. All das beziehe sich nur auf die linke Seite, rechterseits seien alle Organe in Ordnung. Er fährt mißmutig über seine linke Brusthälfte und zeigt: hier ist das Brett. Man muß es ja sehen. Er spüre es deutlich unter seiner Hand* «. These symptoms started two months after the stroke, and the strength of his conviction began to weaken only after a further six months.

150 Anastasopoulos 1954; Critchley 1955.

151 Nathanson, Bergman & Gordon 1952.

152 Ehrenwald 1931 (683: emphasis in original): » *so lang, so tot, so leblos, wie eine Schlange ... die linke Extremität sei fremd, tot ... abhanden gekommen* «.

153 Ehrenwald 1931 (684): » *Er klagt über das Gefühl, daß sich der Körper mehr und mehr parzelliere, daß er ihn mehr und mehr verliere ... ,Wo mag mein Körper sein? Hier sind doch nur Trümmer, die ich nicht kenne*‘. «

154 Ehrenwald 1931 (684): » *Auch die inneren Organe scheinen im Bereich der linken Körperhälfte verändert, ja überhaupt außer Funktion gesetzt und werden in wahnhaft anmutenden Äußerungen durch einen toten, körperfremden, der Außenwelt zugehörigen Automatismus ersetzt.* «

155 Ehrenwald 1931 (682).

156 They form one of Kurt Schneider’s so-called first rank symptoms of schizophrenia, and are experienced by about half of all patients with schizophrenia (Thorup, Petersen, Jeppesen *et al* 2007).

157 Thomas & Forde 2006; Lag, Hveem, Ruud *et al* 2006.

158 Laeng, Shah & Kosslyn 1999.

159 Price & Friston 2002b (437): ‘Living things (irrespective of task) increased activation in the right middle frontal and right fusiform gyri. Non-living things (irrespective of task) increased activation in the same left posterior middle temporal area seen for tools and inanimate objects by Martin *et al* 1996 [Martin, Wiggs, Ungerleider *et al* 1996], Damasio *et al* 1996 [Damasio, Grabowski, Tranel *et al* 1996], Mummery *et al* 1996 [Mummery, Patterson, Hodges *et al* 1996] and Mummery *et al* 1998 [Mummery, Patterson, Hodges *et al* 1998].’ The authors are commenting on the findings of Cappa, Perani, Schnur *et al* 1998. See also Damasio, Tranel, Grabowski *et al* 2004; and Capitani, Laiacona, Mahon *et al* 2003. One study (Cousin, Peyrin & Baciú 2006), based entirely on linguistic terms, found that ‘living’ was more left-lateralised than ‘edible’, a finding that they claim ‘is in agreement with those provided by other studies using categorization tasks’, citing six papers. Not one of those papers supports this finding: only one even refers to the living/non-living distinction, having nothing whatever to say about differential lateralisation of living versus non-living stimuli.

160 Mormann, Dubois, Kornblith *et al* 2011. What is more, animal images that elicited neuronal responses in the amygdala contained both aversive and cute animals, and there was ‘no relationship between amygdala responses and either the valence or arousal of the animal stimuli’, the implication being that it is animacy *per se*, not an emotional response to an animal, that underlies the distinction.

161 Cao, Zhao, Tan *et al* 2013; Chao, Weisberg & Martin 2002.

162 Cutting & Dunne 1989.

163 Price & Friston 2002b (436); Martin, Wiggs, Ungerleider *et al* 1996; Damasio, Grabowski, Tranel *et al* 1996. On left-handers: Frey, Funnell, Gerry *et al* 2005.

164 See, eg, Dixon, Piskopos & Schweizer 2000; Gale, Done & Frank 2001; Warrington & Shallice 1984; Gainotti 1996; Basso, Capitani & Laiacina 1988; Masullo, Piccininni, Quaranta *et al* 2012. The last study, while confirming the usual findings that musical instruments sort with the living, and that body parts do not, oddly chooses to conclude, not that this tells one something about body parts and musical instruments, but that it invalidates the distinction between inanimate and animate.

165 Behnke 1997.

166 Belfi, Bruss, Karlan *et al* 2016; Hoenig, Müller, Herrnberger *et al* 2011; Masullo, Piccininni, Quaranta *et al* 2012.

167 Belfi, Bruss, Karlan *et al* 2016.

168 Chernigovskaya 1999.

169 Hallowell 2002 (22).

170 Oriel 2014.

171 Sierra, Lopera, Lambert *et al* 2002. The sense of animacy is frequently lost in schizophrenia, forming a further parallel with right hemisphere damage.

172 Milner 1974; Rasmussen & Milner 1977.

173 Querné, Eustache & Faure 2000; Hutner & Liederman 1991; Querné & Faure 1996; Regard, Cook, Wieser *et al* 1994.

174 Regard, Cook, Wieser *et al* 1994.

175 Sack, Camprodon, Pascual-Leone *et al* 2005.

176 Chiron, Jambaqué, Nabbout *et al* 1997.

177 Zubler, Seeck, Landis *et al* 2003.

178 Chiron, Jambaqué, Nabbout *et al* 1997.

179 Merola & Liederman 1985.

180 Velichkovsky, Krotkova, Kotov *et al* 2018.

181 Kerestes, Chase, Phillips *et al* 2017.

3. PERCEPTION

- 1 Goethe 1972 (643): » *Denken ist interessanter als Wissen, aber nicht als Anschauen* «.
- 2 Wittgenstein 1976a, §66.
- 3 Müller 1873 (7).
- 4 Goldberg & Costa 1981.
- 5 Chapanis 1977. Similarly, Semmes found a discrepancy between unimodal and intermodal representations in the two hemispheres (Semmes 1968). However, Butters and colleagues reported that lesions of the left parietal areas affect cross-modal integration more severely than do lesions of the right parietal areas (Butters, Barton & Brody 1970).
- 6 Nakamura & Mishkin 1986; Nakamura & Mishkin 1980.
- 7 Möttönen & Watkins 2009.
- 8 Willems, Labruna, D’Esposito *et al* 2011.
- 9 Merleau-Ponty 1962 (249).
- 10 Broca 1861. The patient was known as ‘Tan’ because this nonsense syllable was the only utterance of which he was still capable.
- 11 Hughlings Jackson 1864 (604).
- 12 Hughlings Jackson 1874; and reprinted 1915 (101).
- 13 Avianus Vindicianus; see McGilchrist 2009a (464, n1) for history, discussion of sources and validity of attribution.
- 14 Stimulus detection: Davidoff 1977; localisation: Kimura 1969; Bryden 1976; depth detection: Grabowska 1983; Benton & Hécaen 1970; Carmon & Bechtoldt 1969; Danta, Hilton & O’Boyle 1978; Fortin, Ptito, Faubert *et al* 2002; size estimation: Szatkowska, Grabowska & Nowicka 1993; Corballis, Funnell & Gazzaniga 2002; orientation matching: Longden, Ellis & Iverson 1976; Atkinson & Egeth 1973; Corballis, Funnell & Gazzaniga 2002; adaptation to orientation: Grabowska 1987; orientation discrimination: Corballis, Funnell & Gazzaniga 2002; Franklin, Catherwood, Alvarez *et al* 2010.
- 15 Corballis, Funnell & Gazzaniga 2002.
- 16 Kosslyn, Koenig, Barrett *et al* 1989; Baciú, Koenig, Vernier *et al* 1999.
- 17 Moscovitch 1979.
- 18 Kartsounis & Warrington 1991; Warrington & Rudge 1995; McCarthy & Warrington 1990.
- 19 Volberg 2014.
- 20 Warrington & Taylor 1973; Warrington & Taylor 1978.
- 21 Corballis & Sergent 1988.
- 22 Gazzaniga 2011 (92–3).
- 23 Grabowska & Nowicka 1996.
- 24 Peyrin, Mermillod, Chokron *et al* 2006.
- 25 Giammattei & Arndt 2012.
- 26 Peyrin, Baciú, Segebarth *et al* 2004; Peyrin, Schwartz, Seghier *et al* 2005.

27 Ratinckx, Brysbaert & Vermeulen 2001.

28 Nowicka & Tacikowski 2011.

29 See Elliot & Maier 2014. 2.3 million: Linhares, Pinto & Nascimento 2008; 7.5 million: Nickerson & Newhall 1943; 10 million: Judd 1952 (171); almost infinite number of combinations: Hård & Sivik 2001.

30 Kuehni 2016.

31 Colour: Davidoff 1976; De Renzi & Spinnler 1967; Scotti & Spinnler 1970; Hannay 1979; Sasaki, Morimoto, Nishio *et al* 2007; Brewer, Liu, Wade *et al* 2005; Coull, Vidal, Nazarian *et al* 2004. One experimental study found no difference, however: Danilova & Mollon 2009. Brightness: Nicholls, Bradshaw & Mattingley 1999; Kaushall 1975; Mattingley, Bradshaw, Nettleton *et al* 1994; Mattingley, Berberovic, Corben *et al* 2004; Davidoff 1975. Near total inability to determine brightness, a so-called ‘brightness agnosia’, without impairment of other aspects of visual perception, has been reported in a subject with right hemisphere damage (Nijboer, Nys, van der Smagt *et al* 2009).

32 Howard, ffytche, Barnes *et al* 1998; Kosslyn, Thompson, Costantini-Ferrando *et al* 2000.

33 Njemanze, Gomez & Horenstein 1992; Mendola, Rizzo, Cosgrove *et al* 1999; Clapp, Kirk & Hausmann 2007; Levy & Trevarthen 1981; Barnett 2008; Pirot, Pulton & Sutker 1977; Davidoff 1976; Hannay 1979; Scotti & Spinnler 1970; Pennal 1977; Pallis 1955.

34 Blaxton, Bookheimer, Zeffiro *et al*, 1996; Koutstaal, Wagner, Rotte *et al* 2001.

35 Vuilleumier, Henson, Driver *et al* 2002 (497).

36 Kosslyn 1987.

37 Verma & Brysbaert 2011. Compare the fact that tools are coded in the left hemisphere, even in left-handers. See McGilchrist 2009b (55 & 471–2, n179) for details.

38 Stevens & Davis 1938 (152–4). Interestingly, pitch is a continuum, not composed of quanta: Wever & Lawrence 1954 (405).

39 Tervaniemi & Hugdahl 2003; Zatorre, Belin & Penhune 2002; Hyde, Peretz & Zatorre 2008.

40 See, eg, Bilger, Matthies, Hammel *et al* 1990.

41 Booth, Burman, Meyer *et al* 2002; Hesling, Clément, Bordessoules *et al* 2005; Meyer, Alter, Friederici *et al* 2002; Meyer, Steinhauer, Alter *et al* 2004; Zhang, Shu, Zhou *et al* 2010; Blonder, Bowers & Heilman 1991; Borod 1993; Breitenstein, Daum & Ackermann 1998; Ross, Thompson & Yenkosky 1977.

42 Lattner, Meyer & Friederici 2005.

43 Bourguignon, De Tiège, de Beeck *et al* 2013.

44 Alcock, Wade, Anslow *et al* 2000; Peretz 1990; Lechevalier 1997; McKinnon & Schellenberg 1997; Matteis, Silvestrini, Troisi *et al* 1997; Platel, Price, Baron *et al* 1997; O’Boyle & Sanford 1988; Perry, Zatorre & Evans, 1996; Perry, Zatorre, Petrides *et al* 1999a; Perry, Zatorre, Petrides *et al* 1999b; Meyer, Steinhauer, Alter *et al* 2004.

45 Evers, Dannert, Rodding *et al* 1999; Preisler, Gallasch & Schulter 1989; Passynkova, Neubauer & Scheich 2007; Tramo & Bharucha 1991.

46 Speech: Geiser, Zaehle, Jäncke *et al* 2008; Hurschler, Liem, Jäncke *et al* 2013; Zhang, Shu, Zhou *et al* 2010. Music: Marin & Perry 1999; Popescu, Otsuka & Ioannides 2004; Sakai, Hikosaka, Miyauchi *et al* 1999; Peretz 1990; Roland, Skinhøj & Lassen 1981; Horváth, Schwarcz, Aradi *et al* 2011

47 Lechevalier 1997; Platel, Price, Baron *et al* 1997.

48 McGilchrist 2009a (75). Furthermore, metrical accenting is mainly left hemisphere-dependent in professional musicians (Abecasis, Brochard, Del Río *et al* 2009).

49 Khateb, Pegna, Landis *et al* 2007.

50 Temple, Jeeves & Vilarroya 1989; Temple, Jeeves & Vilarroya 1990; Temple & Ilsley 1993.

51 Farris, Ring, Black *et al* 2016.

52 Hurschler, Liem, Oechslin *et al* 2015; Hurschler, Liem, Jäncke *et al* 2013.

53 Spierer, De Lucia, Bernasconi *et al* 2010; Krumbholz, Eickhoff & Fink 2007; Krumbholz, Schonwiesner, Rubsamen *et al* 2005; Dietz, Friston, Mattingley *et al* 2014.

54 Dietz, Friston, Mattingley *et al* 2014; At, Spierer & Clarke 2011; Spierer, De Lucia, Bernasconi *et al* 2010; Tanaka, Hachisuka & Ogata 1999.

55 Bushdid, Magnasco, Vosshall *et al* 2014.

56 Ohloff 1994; Ellena 2012 (entry for 22 July 2010).

57 Right hemisphere predominantly involved in odour recognition: Kobayashi 2006; Small & Prescott 2005; Cerf-Ducastel & Murphy 2001; Royet & Plailly 2004; Hudry, Ryvlin, Saive *et al* 2014; Zucco & Tressoldi 1989; Zatorre & Jones-Gotman 1990; Zatorre, Jones-Gotman, Evans *et al* 1992; Zald & Pardo 1997; Dijksterhuis, Møller, Bredie *et al* 2002; Kurth, Zilles, Fox *et al* 2010. One study, which measured odour naming as well as differentiation, found equal right and left hemisphere activations: Qureshy, Kawashima, Imran *et al* 2000. In gustation: Kurth, Zilles, Fox *et al* 2010; Small, Jones-Gotman, Zatorre *et al* 1997; Singh, Iannilli & Hummel 2011; Lötsch, Reither, Bogdanov *et al* 2015; Lötsch, Ultsch, Eckhardt *et al* 2016; though two studies suggest no lateral difference: Kinomura, Kawashima, Yamada *et al* 1994; and Veldhuizen, Albrecht, Zelano *et al* 2011.

58 Left hemisphere predominantly involved in emotional reaction to odours: Plailly, Bensafi, Pachot-Clouard *et al* 2005; Broman, Olsson & Nordin 2001; Hudry, Ryvlin, Saive *et al* 2014. Or, since this applies mainly to repugnant odours – the right hemisphere being associated with reactions to pleasant odours – may be to do with the tendency for disgust to lateralise to the left hemisphere.

59 Pazart, Comte, Magnin *et al* 2014; Brand & Brisson 2012. However, this suggestively parallels a situation in music. Here the appreciation of music is almost entirely right hemisphere-dependent – all aspects of melody and harmony are critically dependent on the right hemisphere, though the left hemisphere can process simple rhythm (if there are complex rhythm patterns or cross rhythms and syncopations, the right hemisphere is once again predominant). Nonetheless, professional musicians, perhaps like sommeliers, are more dependent on the left hemisphere than amateurs. In the case of musicians there are various possible explanations: (a) professional musicians may take a more analytic approach; (b) they are trained to read music (a serial process much like reading sentences, which is known to be heavily left hemisphere-dependent); (c) they are trained to co-ordinate both hands, and therefore hemispheres, in almost every musical activity; and (d) they are much more familiar with the pieces that they perform than any amateur (since familiarity – as opposed to simple recognition – tends to activate categorisation processes in the left hemisphere). If the findings on olfaction are a parallel phenomenon, they cannot depend on the first three, and must depend on the fourth, familiarity: amateurs are encountering newness, where experts are categorising familiarities. In *The Master and his Emissary*, I argued that this was the most likely explanation in relation to music, too, since the contrapuntal music of JS Bach appears to be an exception to the rule that professional musicians rely more on the left hemisphere. In dealing with fugal material they still rely almost entirely on the right hemisphere – which also cannot be explained by the first three hypotheses, but does make sense in terms of the last, since the music of Bach, almost alone, is impossible to attend to in its entirety (as the researchers themselves hypothesised, a range of melodic contours needs to be maintained in awareness simultaneously), and is therefore effectively new on every encounter. For details, see McGilchrist 2009b, 72–7.

- 60** Squeri, Sciutti, Gori *et al* 2012; see also Varney & Benton 1975; Goble, Noble & Brown 2009; Goble & Brown 2008; Cohen & Levy 1988.
- 61** Meador, Ray, Day *et al* 1998.
- 62** Young & Ellis 1979; Young, Bion & McWeeny 1987.
- 63** Olausson, Charron, Marchand *et al* 2005; Davis, Pope, Crawley *et al* 2004; Craig, Chen, Bandy *et al* 2000.
- 64** Vancleef, Wagemans & Humphreys 2013; Tomlinson, Davis, Morgan *et al* 2011. For rats: Udalova 1984.
- 65** Critchley, Wiens, Rotshtein *et al* 2004.
- 66** Shibahara & Lucero-Wagoner 2002. For reviews of right hemisphere language, see Beeman & Chiarello 1998; and Joanette, Goulet & Hannequin 1990.
- 67** Doyon & Milner 1991; Lansdell 1970; Robertson, Lamb & Knight 1988.
- 68** Habekost & Bundesen 2003.
- 69** For RH and attentional shifts; Corbetta, Kincade, Ollinger *et al* 2000; Arrington, Carr, Mayer *et al* 2000.
- 70** Britz, Landis & Michel 2009.
- 71** Sterzer & Kleinschmidt 2007.
- 72** Quote from Lumer, Friston & Rees 1998. See also, eg, Megumi, Bahrami, Kanai *et al* 2015; Weilhhammer, Stuke, Hesselmann *et al* 2017.
- 73** Daini, Facchin, Bignotti *et al* 2010; Bonne, Pavlovskaya, Ring *et al* 2004.
- 74** Zaretskaya, Thielscher, Logothetis *et al* 2010. An opposite result, which is controversial in view of the strong consensus of the rest of the literature on perceptual rivalry depending on the right hemisphere, was found in one study, but the numbers were small (N=6), and the stimulatory rather than inhibitory effect of the TMS regime has been questioned (Carmel, Walsh, Lavie *et al* 2010).
- 75** Knyazeva 2013; Mondloch, Geldart, Maurer *et al* 2003; Scherf, Behrmann, Kimchi *et al* 2009; Kovács 2000.
- 76** Doyon & Milner 1991; Lansdell 1970; Robertson, Lamb & Knight 1988.
- 77** Habekost & Bundesen 2003.
- 78** Massman, Delis, Filoteo *et al* 1993.
- 79** Disruption of two long association white matter tracts within the right hemisphere (the superior longitudinal fasciculus and the long segment of the perisylvian network) predict deficits in global feature processing: Chechlacz, Mantini, Gillebert *et al* 2015. On hemispheric asymmetries of neuronal structure and cytoarchitecture, see also Hutsler & Galuske 2003.
- 80** Ventura, Delgado, Ferreira *et al* 2019.
- 81** Mills, Alwatban, Hage *et al* 2017. See, eg, Berlucchi & Aglioti 1997; Devinsky & D'Esposito 2004.
- 82** Joseph 1982; Tucker 1981; Tucker 1992; Bear 1983; Pribram 1981.
- 83** Sullivan & Dufresne 2006; Sullivan & Gratton 2002; Craig 2002.
- 84** Craig 2002; Critchley, Wiens, Rotshtein *et al* 2004; Pollatos & Schandry 2004.
- 85** Devinsky 2000.
- 86** Velichkovsky, Krotkova, Sharaev *et al* 2017.
- 87** For a fuller discussion, see McGilchrist 2016.

88 Lou, Luber, Crupain *et al* 2004; Maguire, Burgess & O’Keefe 1999; Vogeley & Fink 2003; Maguire, Burgess, Donnett *et al* 1998; Keenan, Nelson, O’Connor *et al* 2001.

89 Those who are interested in further exploration are referred to McGilchrist 2009b (87–91).

90 Farb, Segal, Mayberg *et al* 2007. For further discussion of mindfulness and its brain correlates, see Appendix 7.

91 Devinsky 2000; Feinberg, Deluca, Giacino *et al* 2005; Bogousslavsky & Regli 1988.

92 Craik, Moroz, Moscovitch *et al* 1999; Schiffer, Zaidel, Bogen *et al* 1998; Devinsky 2000; Wheeler, Stuss & Tulving 1997; Stuss & Alexander 2000; Stuss, Gallup & Alexander 2001; Stuss 1991b; Stuss, Picton & Alexander 2001; Lou, Luber, Crupain *et al* 2004.

93 Cutting 2011. A small survey of 13 cases (Lance 1976) is in keeping with this: 10 out of 13 cases of visual hallucinations involved right-sided lesions (no information on handedness is given). See also Edwards-Lee & Cummings 2000.

94 Braun & Suffren 2011.

95 Teuber, Battersby & Bender 1960 (13 out of 15 cases); Hécaen & Garcia Badaracco 1956b (14 out of 16 cases); see Teuber *et al*, *op cit* (104–5) for discussion. See also Hécaen & Garcia Badaracco 1956a.

96 Penfield 1959 (525). See also Penfield 1958 (220).

97 Mouren & Tatossian 1963. In this study the authors make a distinction between two types of anomalous experiences, one, like this, having the qualities of real, plain sight, the other fainter and vaguer, more like normal imagination: but in either case the lateralisation was right hemisphere (almost invariably parieto-occipital): « *La latéralisation lésionnelle à l’hémisphère droite est nette dans les deux éventualités* ».

98 Yoshimura, Uchiyama, Kaneko *et al* 2010.

99 Right hemisphere: Ghosh, Wycoco & Ghosh 2015; Yoshimura, Uchiyama, Kaneko *et al* 2010; Anderson & Rizzo 1994; Hoksbergen, Pickut, Mariën *et al* 1996; Inafuku, Sakai, Sakamoto *et al* 1994; Sakai, Kondo & Tomimoto 2015; Nagaoka, Ookawa & Maeda 2004; Serra Catafau, Rubio & Peres Serra 1992; Chan, Anderson, Pijnenburg *et al* 2009; Chrispal, Prabhakar, Boorugu *et al* 2009; Pai 1997 (one case, despite the title, which refers to two); Yamakawa, Takenaka, Sumi *et al* 1994; Rafique, Richards & Steeves 2018; Kleiter, Luerding, Diendorfer *et al* 2007; Coppo & Brignolio 1990; Beniczky, Kéri, Vörös *et al* 2002; Güzelcan, Kleinpenning & Vuister, 2008; Assadi, Baseman & Hyman 2003; Wong, Ko & Wai 1993; Kurata, Miyasaka, Yoshida *et al* 1994; Ossola, Romani, Tavazzi *et al* 2010; Arai, Hasegawa, Tanaka *et al* 2014; Kumral, Uluakay & Dönmez 2015; Chen & Liu 2011; Adachi, Nagayama, Anami 1994; Choi, Lee, Kang *et al* 2005; Barré, Hamelin, Minotti *et al* 2008; Rubin, Espiridion & Lofgren 2018; Tsai, Hsu, Huang *et al* 2010; Ramani 1985; Tanriover, Kacira, Ulu *et al* 2008; Thomas, Barrès & Chatel 1991; Kattah, Luessenhop, Kolsky *et al* 1981 (two cases); Landis, Cummings, Benson *et al* 1986 (two cases); Asri, Tazi, Maaroufi *et al* 2007 (two cases); Beck, Aschayeri & Keller 1978 (two cases); Lance, Cooper & Misbach 1974 (four cases); Lehmann, Bremond, Rabaud *et al* 1975 (eight cases): ‘8.8 % (of a series of 90 patients) suffered from visual illusions, which always were related to large and right-sided masses’; Chan, Anderson, Pijnenburg *et al* 2009 (10 cases); Walters, Harrison, Williamson *et al* 2006 (25 cases): ‘All of the patients (100%) with visual field defects in the current study had left visual field abnormalities. No right visual field defects were detected across confrontational tasks for any of the patients’. Left hemisphere: Sichart & Fuchs 1992; Cole 1999; Tokida, Takeshima, Takeshita *et al* 2018; Lee, Kim, Kim *et al* 2011; Waragai, Takaya & Hayashi 1996; Kim, Park, Intenzo *et al* 1993; Harris, Townsend, Brockmeyer *et al* 1991; Rousseaux, Debrock, Cabaret *et al* 1994; Shiga, Makino, Ueda *et al* 1996; Ghosh, Motamedi, Osborne *et al* 2010; Nakajima 1991 (two cases).

100 Jang, Youn, Seok *et al* 2011; ffytche, Lappin & Philpot 2004; Landis, Cummings, Benson *et al* 1986 (one case out of three reported).

101 Rousseaux, Debrock, Cabaret *et al* 1994. See also ffytche, Lappin & Philpot 2004.

102 Grossman 1988; Garcia & Stick 1986.

103 Gonzalo-Fonrodona 2007.

104 Pérennou, Mazibrada, Chauvineau *et al* 2008; Dieterich, Bartenstein, Spiegel *et al* 2005. Some of these distortions are the result of visual neglect itself, but many of them are not: see Harvey, Milner & Roberts 1995; Milner & Harvey 1995; Nichelli, Rinaldi & Cubelli 1989; Girkin, Perry & Miller 1999. In cases consequent on neglect, the phenomenon can be reduced by cueing attention to the neglected left visual field (Kerkhoff, Schindler, Keller *et al* 1999).

105 Gross & Huber 1972: » *Auf der Straße waren alle Häuser so schräg, standen nicht mehr aufrecht* «. Cf also, Cutting 1997 (112–4); Ebel, Gross, Klosterkotter *et al* 1989; Huber & Gross 1989.

106 Lance 1976.

107 Right precuneus: Mailo & Tang-Wai 2015; right occipital: see, eg, Bender & Teuber 1947; Sun & Lin 2004; Frassinetti, Nichelli & di Pellegrino 1999.

108 Nijboer, Ruis, van der Worp *et al* 2008.

109 Brégeat, Klein, Thiébaud *et al* 1947; Shiga, Makino, Ueda *et al* 1996; Imai, Nohira, Miyata *et al* 1995.

110 Frassinetti, Nichelli & di Pellegrino 1999.

111 Gloning, Gloning & Hoff 1968.

112 Mouren & Tatossian 1963.

113 Following stroke in the right occipitotemporal area: Kassubek, Otte, Wolter *et al* 1999; stroke in the right parieto-occipital region: Montalvo & Khan 2014; damage to the right prestriate cortex (part of the occipital lobe): Frassinetti, Nichelli & Di Pellegrino 1999 (NB this is erroneously reported as due to a left-sided lesion by Park, Choi, Kim *et al* 2007); right temporoparietal infarction: Ceriani, Gentileschi, Muggia *et al* 1998; right occipital lesion: Bender & Teuber 1948; infarction in the medial aspect of the right temporo-occipital lobe: Park, Choi, Kim *et al* 2007; and in one patient, with recurrent episodes of hemimicropsia, the misperception disappeared after removal of an occipital cavernous angioma in the right prestriate cortex (Kassubek, Otte, Wolter *et al* 1998). In two further cases, one involved right occipital stroke, leading, as expected to left hemimicropsia; but the other, involving bilateral occipital infarction, led to hemimicropsia in the right visual field (Cohen, Gray, Meyrignac *et al* 1994).

114 Frassinetti, Nichelli & di Pellegrino 1999.

115 See, eg, Seron, Mataigne, Coyette *et al* 1995; Nass, Sinha & Solomon 1985; Ebata, Ogawa, Tanaka *et al* 1991.

116 Heutink, Brouwer, Kums *et al* 2012; Dalrymple, Davies-Thompson, Oruc *et al* 2014.

117 Jonas, Descoins, Koessler *et al* 2012; Pitcher, Charles, Devlin *et al* 2009.

118 Hemimicropsia: Miwa & Kondo 2007; hemimicropsia: Schroeder, Schneider-Gold, Behrendt *et al* 2017 (note that the authors in this paper and in the preceding one by Miwa & Kondo are using the term ‘right’ here to refer to the side of the face of the person as viewed from that person’s own perspective, the part that is, therefore in the patient’s *left* visual field; whereas the other papers here cited use the term ‘left’ for the very same phenomenon); Heo, Cho, Lee *et al* 2004; Nagaishi, Narita, Gondo *et al* 2015; Saito, Matsunaga, Yamamura *et al* 2014; Hishizawa, Tachibana & Hamano 2015.

119 Ebata, Ogawa, Tanaka *et al* 1991.

120 Brust & Behrens 1977 (432).

121 Nass, Sinha & Solomon 1985; Dalrymple, Davies-Thompson, Oruc *et al* 2014; Kamikubo, Abo & Yatsuzuka 2008; Phua, Bhaskar & Calic 2019. The Picasso reference is from Phua *et al*.

122 Horrax 1923. In a report of two cases of a central scotoma (an area of diminished vision), one had right-sided, the other left-sided, pathology (Brust & Behrens 1977).

123 Trojano, Conson, Salzano *et al* 2009; Imai, Nohira, Miyata *et al* 1995; Shiga, Makino, Ueda *et al* 1996; Nijboer, Ruis, van der Worp *et al* 2008. Interestingly, the four cases also showed metamorphopsia for objects or body parts, typically processed by the left hemisphere. The case reported by Satoh and colleagues is sometimes included here, though it involved not left hemisphere hypoperfusion, but hyperperfusion, so that interpretation is more difficult: there was a marked increase in blood flow in the left occipital pole while the patient experienced the visual distortions, and a marked decrease in blood flow after the symptoms disappeared (Satoh, Suzuki, Miyamura *et al* 1997).

124 Trojano, Conson, Salzano *et al* 2009 (emphasis added).

125 Cho, Moon, Hong *et al* 2011.

126 McCarty, Gordon, Walker *et al* 2017.

127 Parks, Rigby, Gubitz *et al* 2014.

128 For a survey, see the fascinating review of 757 patients by Gross and Huber, one of the most acutely observed to date (1972). The most interesting series in English is that of Chapman (1966). Alterations in size, distance, constancy, shape, brightness, and motion perception were the commonest described by Chapman in schizophrenia: all of these depend primarily on the right hemisphere (Chapman *op cit*, esp 230). See also Waters, Collerton, ffytche *et al* 2014.

129 Gross *et al*, *op cit* (125): » *Ich sah einen Mann, der plötzlich Zähne und eine Schnauze wie ein Kaninchen hatte* «.

130 *ibid* (126): » *Immer wieder sah ich für kurze Zeit die Dinge über Kreuz, in verwirrender Weise gegeneinander verschoben* «.

131 Cutting 1997 (112–4).

132 *ibid*.

133 Ebel, Gross, Klosterkotter *et al* 1989; Huber & Gross 1989.

134 Parnas, Møller, Kircher *et al* 2005.

135 Gross & Huber 1972 (124): » *die Einrichtungsgegenstände erschienen verzerrt und klein, das Zimmer lang und breit* «.

136 *ibid*: » *Die Menschen waren verändert, an einem Tag alle ganz groß, an einem anderen wieder ganz klein* «. See also Weckowicz 1957.

137 See Grover, Kattharaghatta Girigowda & Kumar 2012.

138 ‘Robert’, a schizophrenic patient of Louis Sass: in Sass 2017 (270).

139 Greenberg 2009 (14).

140 Greenberg 2009 (160).

141 Marsh 1979: the words are those of ‘Alicia H’, a patient in the prodrome to schizophrenia, after taking LSD.

142 Cutting 1997 (234).

143 Jaspers 1963 (81).

- 144** Gross & Huber 1972 (124): » *alles war ... so weit weg* «.
- 145** Wagner & Spiro 2008 (75).
- 146** Wagner & Spiro 2008 (109).
- 147** Keefover, Ringel & Roy 1988.
- 148** McGhie & Chapman 1961 (109).
- 149** Cutting 1997 (93).
- 150** Sechehaye 1994 (89 & 94).
- 151** Ebel, Gross, Klosterkötter *et al* 1989; Huber & Gross 1989.
- 152** Cutting 2002 (179).
- 153** Chapman 1966 (230).
- 154** Gross & Huber 1972 (124).
- 155** *ibid* (125): » *Das sonst so schmale Gesicht der Schwägerin war breit und rot, der Mund verzogen* «.
- 156** *ibid*: » *Die linke Hälfte des Gesichtes meines Mannes sah plötzlich ganz anders aus, so traurig und ernst, ganz anders als die rechte Hälfte, so als ob mein Mann geteilt wäre* «.
- 157** *ibid*.
- 158** *ibid*: » *im Sinne einer Knickung, Krümmung oder Schlängelung* «.
- 159** Guttmann & Maclay 1937.
- 160** Blom 2016.
- 161** Macropsia and micropsia, at least, may not be uncommon in the general population: a survey of Japanese schoolchildren found a prevalence of 6–8% (Abe, Oda, Araki *et al* 1989).
- 162** Lippman 1952. Lippman describes seven patients, some of whom had strikingly Alice-like symptoms, and explicitly makes the connexion with Dodgson. Podoll & Robinson (1999) refer to a drawing of a figure with parts of the face and hand missing in such a way as to suggest that Dodgson had a rounded paracentral negative scotoma such as may be experienced in migraine; in fact the eminent ophthalmologist William Bowman had diagnosed such a scotoma in Dodgson's case in 1856. Dodgson also referred in an 1885 entry in his diary to having 'experienced, for the second time, that odd optical affection of seeing moving fortifications, followed by a head-ache', a clear description of migraine. Although this suggests this was only his second attack, there is good reason to believe he may have suffered migraine attacks accompanied by aura, but without headache – a common enough phenomenon – for many years. Possibly in favour of a diagnosis of temporal lobe epilepsy, Dodgson reported in his diary that he 'had an attack ("epileptiform" Dr Morshead called it) which left me with a sort of headache and not feeling my usual self for a week or ten days' (entry for 20 January 1886). Apparently two other physicians also thought he suffered from temporal lobe epilepsy (TLE). In the clinical setting, without the possibility of EEG studies, the differential between migraine and TLE can be difficult to make, and the conditions are thought by some to be related (see, eg, De Simone, Ranieri, Marano *et al* 2007). See also, in favour of a diagnosis of TLE: LaPlante 1993 (esp 70–2). A balanced view is probably that of neurologist Yvonne Hart, that Dodgson very likely had migraine and possibly had epilepsy (Hart 2010).
- 163** Coleman 1933 (48).
- 164** Lippman 1952.
- 165** One had right-sided headaches, and the visual field of the distortion in the last case referred to just now was to the right, which on the face of it suggests left-sided pathology. However, the situation is complicated, since, as we have seen, right-sided pathology gives rise to effects in both the

left *and* right visual fields. The upshot: it is reasonable to assume that effects in the left visual field are due to right-sided pathology, but it is not safe to assume that effects in the right visual field are due to left-sided pathology.

166 Todd 1955 (emphasis added).

167 In one case a woman displayed hypoperfusion in the right frontoparietal operculum (Morland, Wol, Dietemann *et al* 2013); in another case, symptoms were due to a right temporoparietal cavernoma (Philip, Kornitzer, Marks *et al* 2015); and, in a third, the only lateralised finding was a right frontal abnormality (Sasaki, Kamei & Chida 2002). In a fourth case, distortions were left visual, therefore likely to be due to a right-sided disturbance: ‘a perception of enlargement of the left side of the head, a length increase in left-side extremities, a slowing-down of overall movements, surrounding objects appearing to be far away/smaller’ (Uca & Kozak 2015). The addition of the slowing down effect in this case, which we have seen to be associated with right hemisphere disturbance, is particularly striking, and forms part of the Alice in Wonderland syndrome that is often neglected. Two cases involved right-sided frontal pathology (Weijers, Rietveld, Meijer *et al* 2013; Zwijnenburg, Wennink, Laman *et al* 2002). In another case, concerning a seven year-old girl with metamorphopsia (‘the objects and the people around her seemed bigger or smaller than they were’), it was possible to study her brain perfusion using single photon emission computed tomography (or SPECT), a particularly informative investigation: it showed right frontoparietal hypoperfusion (Gencoglu, Alehan, Erol *et al* 2005). In 2010 Brumm and colleagues carried out a review of the nine SPECT studies in AiWS to date (Brumm, Walenski, Haist *et al* 2010), which included the case of Gencoglu *et al*. In one case findings were normal, but of the remaining seven (so far undiscussed) cases each one showed hypoperfusion in the right parietal or right occipital region, two of them additionally demonstrating hypoperfusion in the left occipital region. The authors comment that ‘hypoperfusion in the right parietal cortex was reported for five cases, whereas left parietal hypoperfusion was not found in any of the nine cases’. They also reported a further case of their own, which involved episodes of micropsia in a child: scans revealed both right and left hypoactivation of the posterior cortex during attacks. In their case study, during one task, an active viewing task, hyperactivation of the right parietal cortex was noted, a possibly discordant finding. The authors comment: ‘this right hemisphere parietal bias is perhaps not a surprising result from this active task, as many studies have implicated the right hemisphere in a variety of spatial attention tasks.’ This could be special pleading, though it is true that hyperactivation can be as pathological as hypoactivation. Among their included cases are also those from a study by Kuo and colleagues, in which SPECT scans were conducted in four children. The criteria here were loose, but even by those standards only three can be said to have had AiWS: one saw eyes becoming larger or smaller, and ‘variant sizes of people’; another saw ‘distorted people’; a third saw the television picture upside down, while ‘windows and house seemed crooked’. In all three cases, the right posterior cortex was involved, though in two of those cases involvement was bilateral. The first case had hypoperfusion in all right hemisphere regions – frontal, temporal, parietal and occipital. The second had right frontoparietal hypoperfusion only; the third had right and left parieto-occipital hypoperfusion, as well as left frontal. All cases showed right parietal involvement, the area which has been most often implicated. (The fourth case is the one marked by alterations of colour cast and ‘scintillations’ only – Kuo, Chiu, Shen *et al* 1998). In a number of other reported cases, no imaging was conducted and no lateralising signs were reported (Tunç & Başbuğ 2017; Liaw & Shen 1991; Lahat, Berkovitch, Barr *et al* 1999).

168 Blom 2016; Mastria, Mancini, Viganò *et al* 2016; Harrison & Harrison 2015.

169 Braun, Duval & Guimond 2005.

170 Lampl, Lorberboym, Gilad *et al* 2005.

171 For schizophrenia, see Chapter 9. For mania: ‘Mania is seen almost exclusively with damage to the right hemisphere’, according to Jeffrey Cummings in a review of neuropsychiatric manifestations of right hemisphere lesions, which agrees with the findings of an earlier review by Starkstein and Robinson (Cummings 1997; Starkstein & Robinson 1997). See also Starkstein, Berthier, Fedoroff *et al* 1990; Starkstein, Fedoroff, Berthier *et al* 1991; Starkstein, Robinson, Honig *et al* 1989; Cummings & Mendez 1984; Braun, Daigneault, Gaudet *et al* 2008; Starkstein, Boston & Robinson 1988. Elation and irritability characterise the left hemisphere: they become unchecked when there is right-sided, particularly right frontal, damage. Overdrive in the left frontal region, whether this takes the form of left hemisphere hypermetabolism (Dunayevich & Keck 2000) or left focal paroxysmal brain excitation, due to epilepsy, is common in mania (Parnas & Korsgaard 1982; Wells 1975).

172 See, eg, Nasrallah 1985.

173 Hugdahl, Løberg, Jørgensen *et al* 2008.

174 Sritharan, Line, Sergejew *et al* 2005.

175 Aleman, Sommer & Kahn 2007. Nonetheless, a single case study of a female patient with both visual and auditory hallucinations who used unilateral nostril breathing, assumed in the study to stimulate the contralateral hemisphere, found that right nostril breathing appeared to be associated with fewer hallucinations (Shannahoff-Khalsa & Golshan 2015). However, she had a diagnosis of both narcissistic and borderline personality disorder as well as of a psychotic disorder; she was already heavily medicated with antipsychotic medication (clozapine) that has a relative suppressive effect on left hemisphere function; females do not show clear lateralising results when compared with males; and it is a matter of dispute whether the hemispheric stimulation is contralateral or ipsilateral (Block, Arnott, Quigley *et al* 1989). According to Bhavanani, Ramanathan, Balaji *et al* 2014, right nostril breathing caused sympathomimetic effects, known to be associated with increased right hemisphere function, and left nostril breathing produced parasympathomimetic effects, known to be associated with left hemisphere function. As a result of all this, probably no sound conclusions can be drawn from the single case described by Shannahoff-Khalsa *et al*, *op cit*.

176 Bremer 1996. The French psychiatrist Jules Séglas described a patient with persecutory hallucinations principally in the right ear: « *Les hallucinations de l’ouïe continuent toujours, presque incessantes, et surtout dans l’oreille droite ... Ces voix, le plus souvent désagréables, ne lui disent plus de sottises, mais des nuances, des ordres brefs et même quelques phrases* » (Séglas 1890, 12). However, Valentin Magnan (1883) reported that four patients with a chronic psychotic illness involving auditory hallucinations experienced unpleasant, critical and hostile remarks in their left ear, and soothing, even flattering remarks in their right ear.

177 Kumar, Sedley, Barnes *et al* 2014.

178 Berrios 1991.

179 Wieser 2003.

180 Isolan, Bianchin, Bragatti *et al* 2010; Woo, Leung, Cheng *et al* 2014; Futamura, Katoh & Kawamura 2014; Calabrò, Baglieri, Ferlazzo *et al* 2012; Evers, Ellger, Ringelstein *et al* 2002; Paquier, van Vugt, Bal P *et al* 1992; Keshavan, Kahn & Brar 1988; Mackworth-Young 1983; Augustin, Guegan-Massardier, Levillain *et al* 2001; Kasai, Asada, Yumoto *et al* 1999; Nagaratnam, Virk & Brdarevic 1996.

181 Couper 1994; Kumar, Sedley, Barnes *et al* 2014; Terao & Tani 1998; De Maeseneire, Duray, Tyberghien *et al* 2014; Ozsarac, Aksay, Kiyan *et al* 2012; Williams, Tremont & Blum 2008; Cerrato, Imperiale, Giraudo *et al* 2001.

182 Kobayashi 2018.

183 Golden & Josephs 2015.

184 Right orbitofrontal: DiFabio, Casali, Giugni *et al* 2009; right orbitofrontal and superior temporal gyri: Mizobuchi, Ito, Tanaka *et al* 1999; right posterior insula: Beume, Klingler, Reinhard *et al* 2015; right temporal: Hayashi 2004; left uncinate gyrus: Nye & Arendts 2002.

185 Badalian, Temin, Mukhin *et al* 1993; Ambrosetto 1986; Inutsuka, Ogino, Yoshinaga *et al* 2003.

186 15%: McGrath, Avramopoulos, Lasseter *et al* 2009; 35%: Kopala, Good & Honer 1994.

187 Vallar 2007; Gallace, Tan & Spence 2007; Halligan, Marshall & Ramachandran 1994; Walters, Harrison, Williamson *et al* 2006 (which, despite its title, also deals with tactile hallucinations).

188 For a review, see Gallace & Spence 2008. See also Vallar 2007. Reports include: right hemisphere: Cummings 1997; Halligan, Marshall & Ramachandran 1994; right subcortical frontal and frontoparietal: Flynn, Cummings, Scheibel *et al* 1989; right temporoparieto-occipital: Peroutka, Sohmer, Kumar *et al* 1982; Akıncı, Öncü & Topçular 2016; right occipital: Beniczky, Kéri, Vörös *et al* 2002. Bilateral (greater left): Wada, Kawakatsu, Komatani 1999; left temporoparietal: Nagaratnam & O'Neile 2000 (two cases).

189 McGilchrist & Cutting 1995.

190 Serafetinides 1965. In this study the majority of the subjects, whether the focus was left- or right-sided, had gross pathology – sclerosis or tumour – underlying the focus, which makes it clearer than ever that we are dealing with the dysfunction of an affected hemisphere as a whole. A study in cats showed predominantly excitations in the left hemisphere after administration of hallucinogenic drugs, including ketamine and phencyclidine (Contreras, Dorantes, Mexicano *et al* 1986). A recent study in humans shows greater reductions in brain activation in the right hemisphere than the left, particularly in the frontal and temporal region, after administration of LSD, though impairment of the left frontal region plays a part (Schmidt, Müller, Lenz *et al* 2018); in another study, however, the same team found that connectivity between the thalamus and the right fusiform gyrus and insula was related to auditory and visual ‘drug effects’ (Müller, Lenz, Dolder *et al* 2017). A study of mescaline found that it ‘induced a decrease in functioning of the right hemisphere’ (Hermle, Gouzoulis-Mayfrank & Spitzer 1998). A single dose of ayahuasca in depression increased perfusion in the left nucleus accumbens, left subgenual area and right insula (Sanches, de Lima Osório, Dos Santos *et al* 2016).

4. JUDGMENT

1 Merleau-Ponty 1945 (52): « *La perception est un jugement, mais qui ignore ses raisons, ce qui revient à dire que l'objet perçu se donne comme tout et comme unité avant que nous en ayons saisi la loi intelligible* ».

2 Since there is a wealth of evidence that depression is in most cases due to unopposed action of the right frontal pole (usually because of underactivity in the left frontal pole or underactivity of the right posterior cortex – see McGilchrist 2009b (63–4) for detailed discussion), it would not be surprising if delusions of guilt and of poverty, which sometimes accompany severe depression, were due to hyper- rather than hypo- activity of the right hemisphere. However, I am not aware of any evidence that this is the case; and there is some evidence that when depression becomes delusional, there is also important right-sided dysfunction (Skaf, Yamada, Garrido *et al* 2002). Cotard's delusion is thought to be a depressive delusion, but is clearly associated with right parietal *deficits* (see below).

3 Young 2000.

4 Stangeland, Orgeta & Bell 2018. Cases not included which appear to meet criteria: Peroutka, Sohmer, Kumar *et al* 1982 (one case); Berthier & Starkstein 1987 (one case). One case (out of three reported) in another paper – Mesulam, Waxman, Geschwind *et al* 1976 – might have met criteria.

5 Rubin, Espiridion & Lofgren 2018; Mizukami, Yamakawa, Yokoyama *et al* 1999; Juolasmaa, Outakoski, Hirvenoja *et al* 1981.

6 Marinsek, Turner, Gazzaniga *et al* 2014.

7 Devinsky 2009 (emphasis added).

8 Garety & Freeman 1999; Steffen Moritz & Woodward 2005.

9 Colbert & Peters 2002.

10 Reusser 1986.

11 Braun & Suffren 2011 (1 & 30).

12 Leutmezer, Podreka, Asenbaum *et al* 2003; Mucci, Galderisi, Bucci *et al* 2005; Braun & Suffren 2011.

13 Marinsek, Turner, Gazzaniga *et al* 2014.

14 Braun & Suffren 2011.

15 Joseph 2007; Malloy & Richardson 1994; Feinberg, Deluca, Giacino *et al* 2005; Benson, Djenderedjian, Miller *et al* 1996; Malloy, Cimino & Westlake 1992; Devinsky 2000; Förstl, Almeida, Owen *et al* 1991; Breen, Caine & Coltheart 2001; Postal 2005; Kapur & Coughlan 1980; Alexander, Stuss & Benson 1979; Levine & Grek 1984; Feinberg & Shapiro 1989; Fleminger & Burns 1993; Nakano, Yamashita, Matsuda *et al* 2006; Devine, Bentley, Jones *et al* 2014.

16 Trimble (1991) concludes that about three out of four cases of *de novo* psychosis following temporal lobectomy do so after right temporal lobectomy. A review by Matsuura (1997) confirmed this, finding 24 out of 32 cases of *de novo* post-lobectomy psychosis follow right temporal lobectomy; Mace & Trimble (1991) find 6/6 cases in their series; Manchanda, Miller & Mclachlan (1993) find 4/4 in their series; Shaw, Mellers, Henderson and colleagues (2004) find 7/11 in their series; Leinonen, Tuunainen & Lepola (1994) report 2/3 of their cases. Together these reports yield 43/56 cases following right versus left temporal lobectomy, roughly 77%.

17 Chapters 3 & 4 *passim*.

- 18** Staff, Shanks, Macintosh *et al* 1999; Sultzer, Brown, Mandelkern *et al* 2003; Miller, Chang, Mena *et al* 1993; Ting, Fischer, Millikin *et al* 2015.
- 19** Corlett, Aitken, Dickinson *et al* 2004; Fletcher, Anderson, Shanks *et al* 2001; Turner, Aitken, Shanks *et al* 2004.
- 20** Coltheart 2010; Langdon, McKay & Coltheart 2008; Barbey & Patterson 2011.
- 21** Spitzer 1990; Spitzer 1992.
- 22** Ferro, Kertesz & Black 1987; De Renzi 1982; Bowen, McKenna & Tallis 1999.
- 23** Suchan & Karnath 2011.
- 24** Hécaen & Angelergues 1963.
- 25** Hécaen 1972.
- 26** Gilmore, Heilman, Schmidt *et al* 1992.
- 27** See McGilchrist 2009b (60–1). Also: Rezlescu, Pitcher & Duchaine 2012; Busigny, Van Belle, Jemel *et al* 2014; Jonas, Frismand, Vignal *et al* 2014; Rossion 2014; Van Lancker & Canter 1982; Whiteley & Warrington 1977: ‘a right occipito-temporal lesion is critical’. There are to my knowledge only four cases resulting from left hemisphere damage alone, and in two of those the subject was a left-hander (Tzavaras, Merienne & Masure 1973; and Hécaen & Angelergues 1962). In another case, the focus of abnormality appears to have been left-sided, handedness not given (Wada, Kawakatsu, Komatani *et al* 1999).
- 28** Hécaen & Angelergues 1962.
- 29** Landis, Cummings, Christen *et al* 1986.
- 30** Jonas, Rossion, Brissart 2015.
- 31** Gainotti & Marra 2011; Grüsser & Landis 1991; Kanwisher, McDermott & Chun 1997; Rossion, Caldara, Seghier *et al* 2003; Fox, Iaria & Barton 2008; Fox, Moon, Iaria *et al* 2009.
- 32** Verosky & Turk-Browne 2012.
- 33** Busigny, Joubert, Felician *et al* 2010; Kanwisher 2000; Sergent & Signoret 1992.
- 34** Blank, Wieland & von Kriegstein 2014. See also Lang, Kneidl, Hielscher-Fastabend *et al* 2009; Van Lancker & Canter 1982; Van Lancker, Kreiman & Cummings 1989.
- 35** Feinberg & Roane 2005: ‘in patients who have focal lesions, there is evidence that right hemisphere damage is necessary’. See also Alexander, Stuss & Benson 1979; Young, Flude & Ellis 1991; de Pauw, Szulecka & Poltock 1987; Murai, Toichi, Sengoku *et al* 1997; Fatemi, Boeve, Duffy *et al* 2011; Filley & Jarvis 1987; Staton, Brumback & Wilson 1982; Kapur, Turner & King 1988; Silva, Tekell, Leong *et al* 1995. Lewis found bilateral subcortical lesions (1987). A review of 133 cases from the literature by Berson reports lateralisation, disappointingly, in only two cases: both involve right-sided lesions (1983).
- 36** Förstl, Almeida, Owen *et al* 1991.
- 37** Burgess, Baxter, Rose *et al* 1996 (58–9). A case report of a patient with a left-sided epileptogenic focus is reported by Ardila & Rosseli (1988); and there is one other, reported by Kanemoto (1997), in which the syndrome was observed only during seizures caused by a left hemisphere focus.
- 38** Thode, Faber & Chaudhuri 2012; Madoz-Gúrpide & Hillers-Rodríguez 2010; Abe, Ishii, Fujii *et al* 2007; Feinberg & Keenan 2005; Bourget & Whitehurst 2004; Edelstyn, Oyeboode & Barrett 2001; Förstl, Besthorn, Burns *et al* 1994; Ellis 1994; Silva, Leong & Wine 1993; Cutting 1991; Förstl H, Almeida OP, Owen AM *et al* 1991; Förstl, Burns, Jacoby *et al* 1991; Crichton & Lewis 1990; Förstl 1990; de Pauw, Szulecka & Poltock 1987; Berthier & Starkstein 1987.
- 39** Malloy & Richardson 1994.

- [40](#) Darby & Prasad 2016.
- [41](#) Surawicz & Banta 1975; Shrestha 2014.
- [42](#) Feinberg & Roane 2005.
- [43](#) Jackson 1978.
- [44](#) Lykouras, Typaldou, Mourtzouchou *et al* 2008.
- [45](#) Price & Mesulam 1985; Guard, Delpy, Richard *et al* 1979; Levine & Finklestein 1982; Levine & Grek 1984; Peroutka, Sohmer, Kumar *et al* 1982; Venneri & Shanks 2004; and Barboza, De Freitas, Tovar-Moll *et al* 2013. In one study, however (Mucci, Galderisi, Bucci *et al* 2005), it was suggested that the association only seemed to hold with females – which, since the balance of the hemispheres shifts towards the left hemisphere with age, may be related to the higher incidence of late-onset paranoid psychosis in females: about eight times commoner in women than men. Or it might just be an isolated finding.
- [46](#) Geroldi, Akkawi, Galluzzi *et al* 2000.
- [47](#) Kohn, Shiga, Kusumi *et al* 2006.
- [48](#) Narumoto, Nakamura, Kitabayashi *et al* 2006; Luauté & Saladini 2008; Westlake & Weeks 1999; Richardson, Malloy & Grace 1991; [Ortigue](#) & [Bianchi-Demicheli](#) 2011; Malloy & Richardson 1994; Soyka 1998; Cipriani, Vedovello, Nuti A *et al* 2012; Shepherd 1961.
- [49](#) Kumral & Öztürk 2004.
- [50](#) Silva & Leong 1993.
- [51](#) [Ortigue](#) & [Bianchi-Demicheli](#) 2011; Richardson, Malloy & Grace 1991; Neetesh & Yogaratnam 2012; Braun & Suffren 2011; Graff-Radford, Whitwell, Geda *et al* 2012; Nomura, Kazui, Wada *et al* 2012.
- [52](#) Mize & Jones 2012; Harmon-Jones, Peterson & Harris 2009.
- [53](#) First described by Gaétan Gatian de Clérambault (1921); trans in Cutting & Shepherd 1987, 182–7.
- [54](#) el Gaddal 1989; Anderson, Camp & Filley 1998; Schachter 1977; John & Ovsiew 1996; Heinik, Aharon-Peretz & Hes 1991.
- [55](#) Heinik *et al*, *op cit*.
- [56](#) Signer & Cummings 1987; Brüne & Schröder 2003.
- [57](#) Breen, Caine, Coltheart *et al* 2000.
- [58](#) Eg, Spangenberg, Wagner & Bachman 2008; Villarejo, Martin, Moreno-Ramos *et al* 2011; Ramachandran, Altschuler & Hillyer 1997; Priftis, Rusconi, Umiltà *et al* 2003.
- [59](#) Decety & Chaminade 2003; Keenan, Nelson, O'Connor *et al* 2001; Keenan, Wheeler, Gallup *et al* 2000; Keenan, McCutcheon, Freund *et al* 1999; Morita, Itakura, Saito *et al* 2008; Uddin, Kaplan, Molnar-Szakacs *et al* 2005; Uddin, Molnar-Szakacs, Zaidel *et al* 2006; Frassinetti, Pavani, Zamagni *et al* 2009; Frassinetti, Maini, Romualdi *et al* 2008.
- [60](#) Kaplan, Aziz-Zadeh, Uddin *et al* 2008; Rosa, Lassonde, Pinard *et al* 2008; Platek, Thomson & Gallup 2004.
- [61](#) Cotard 1880; Cotard 1882. The syndrome was earlier described by Charles Bonnet (1788); and less precisely by Wilhelm Griesinger, by Joseph Guislain, and by François Leuret (see Förstl & Beats 1992).
- [62](#) ‘Severe right hemispheric dysfunction’: Debruyne, Portzky, Van den Eynde *et al* 2009; right frontal: Coltheart 2007; Coltheart, Langdon & McKay 2007; right fronto-temporoparietal: Nishio & Mori 2012; right frontoparietal: Perez, Fuchs & Epstein 2014; three cases: two right temporal, one

right frontotemporal: Drake 1988; right temporal: Murai & Fukao 2003; AB Joseph 1986b; Joseph & O’Leary 1986 (suggests right temporal area of key significance in cases of atrophy associated with Cotard’s); right temporoparietal: Young, Robertson, Hellawell *et al* 1992; Gonçalves & Tosoni 2016; right parietal: Wolańczyk, Komender & Brzozowska 1997; right temporo-parieto-occipital: Parks, Rigby, Gubitz *et al* 2014. Charland-Verville and colleagues (Charland-Verville, Bruno, Bahri *et al* 2013) found various bilateral regions of hypoperfusion, but in addition just one lateralised area, the frequently implicated right temporoparietal junction. Young & Leafhead (1996) describe three cases, one right temporoparietal, the others without identifiable focal lesions. However, the other two exhibited, in addition to Cotard’s syndrome, Capgras syndrome, which is known to be right hemisphere-dependent, and all three exhibited prosopagnosia, a strongly right-lateralising sign, with *all three* producing scores on face recognition even lower than the mean for subjects with right brain damage, leading the authors to presume a connexion between right hemisphere dysfunction and Cotard’s. Petracca and colleagues (Petracca, Migliorelli, Vázquez *et al* 1995) made no observations about lateralisation. Two further cases are described by Gardner-Thorpe & Pearn (2004): one had multiple sclerosis and no focal lesion could be identified. The other case is complex: the subject, who had Marfan’s syndrome, had a previous left parietal lesion, which had given rise to transient amnesia and nominal aphasia, which quickly resolved. Three years later, however, he presented with Cotard’s syndrome: on this occasion he had a left visual field defect and MRI showed, amongst other things, a ‘cryptic vascular malformation high in the medial part of the right parietal lobe’, the area implicated in most other cases of localised lesions giving rise to Cotard’s syndrome. See also reviews by Debruyne, Portzky, Van den Eynde *et al* 2009; Debruyne, Portzky, Peremans *et al* 2011; Malloy & Richardson 1994; and Kudlur, George & Jaimon 2007, all of which suggest right hemisphere dysfunction as the critical brain correlate. In a search of the Mayo clinic’s database, in cases where local intracerebral pathology had been identified, it always involved the right hemisphere (or both), never the left hemisphere alone: Sahoo & Josephs 2018. Additionally, there is the common overlap between Cotard’s and Capgras’ syndromes to take into account, as well as overlaps with prosopagnosia, paranoia, derealisation and dysmetropsia, all of which are associated individually with right- rather than left -hemisphere damage. Finally, in Cotard’s paper of 1880, there are no mentions of laterality; in his paper of 1882, however, he offers a series of observations of 11 patients, only one having signs of lateralisation, namely, a left hemiplegia. However, there exist two known cases of Cotard’s syndrome with primary left hemisphere pathology: one definite, though in a child (Bhatia 1993: left parietal), and one possible, in that the subject had no belief that he was dead (Caliyurt, Vardar & Tuglu 2004: left frontotemporoparietal). Oddly, given that, at least in one case, the authors recognise the unusual lateralisation, there is no record of handedness in either case.

63 Young & Leafhead 1996.

64 Sass 2017 (9).

65 Blount 1986. For further cases of overlap between Cotard’s and Capgras’ syndromes, see: AB Joseph 1986b; Yalin, Taş & Güvenir 2008; Wolff & McKenzie 1994; Enoch & Trethowan 1979 (155–78); Butler 2000; Wright, Young & Hellawell 1993; Shiraishi, Ito, Hayashi *et al* 2004; Bleeker & Sno 1983; Förstl, Almeida & Iacoponi 1991; and Kim 1991.

66 Nejad & Toofani 2005.

67 Huber, Karner, Kirchler *et al* 2008; de Leon, Antelo & Simpson 1992; Gallace & Spence 2010; Adunsky 1997; Blanke 2008; Flynn, Cummings, Scheibel *et al* 1989; Narumoto, Ueda, Tsuchida *et al* 2006; Safer, Wenegrat & Roth 1997; Takahashi, Ozawa, Inuzuka *et al* 2003; Blasco-Fontecilla, Bragado Jimenez, Garcia Santos *et al* 2005; Maeda, Yamamoto, Yasuda *et al* 1998.

68 See Chapter 2.

69 Bogousslavsky & Regli 1988. The authors state that there were 449 patients. If so, it remains to be explained why the sum of supratentorial and infratentorial strokes reaches 439.

70 Brugger, Kollias, Müri *et al* 2000; Saadah & Melzack 1994; Melzack 1992; Grouios 1996; Valentin 1836; Weinstein & Sersen 1961; Poeck 1964; Burchard 1965; Melzack, Israel, Lacroix *et al* 1997; Gallagher, Butterworth, Lew *et al* 1998; Ramachandran 1993.

71 For a review, see Moryłowska-Topolska, Ziemiński, Molas *et al* 2017.

72 Duncan, Yilmaz, Gaspar *et al* 2017.

73 See, eg, Braun & Chouinard 1992. For imaging evidence: see, eg, Uher, Murphy, Friederich *et al* 2005; Grunwald, Weiss, Assmann *et al* 2004; lesion evidence: see, eg, Uher & Treasure 2005; cognitive profile: see, eg, Maxwell, Tucker & Townes 1984; resolution after left hemisphere stroke: Dusoir, Owens, Forbes *et al* 2005.

74 Rosen, Allison, Schauer *et al* 2005.

75 Fisher 1994; Flynn, Cummings & Tomiyasu 1988; Isern 1987.

76 Griffith & Hochberg 1988.

77 Williams 1991.

78 McGilchrist, Jadresic, Goldstein *et al* 1993. At one month following his stroke, by which time the syndrome was clinically well established, the only finding was a right-sided infarct. A follow up scan at seven months revealed bilateral thalamic infarcts at that stage.

79 Regard & Landis 1997.

80 Eg, Anzellotti, Onofri, Maruotti *et al* 2011: ‘these experimental data suggest that out of body experiences are associated with damage to the right temporoparietal junction ... whereas autoscopic hallucination is associated with damage to the right parieto-occipital cortex’. See also Blanke, Ortigue, Landis *et al* 2002; Blanke & Mohr 2005; Blanke & Arzy 2005; and Heydrich, Lopez, Seeck *et al* 2011. Heydrich has a series of 9 cases, eight of which had disturbances of the right temporoparietal region: Ionta, Heydrich, Lenggenhager *et al* 2011; Heydrich & Blanke 2013. However in one study there was no clear lateralisation across 10 cases (Devinsky, Feldmann, Burrowes *et al* 1989).

81 Brugger, Blanke, Regard *et al* 2006. But the area is confused. Cases of heautoscopy are described after right hemisphere pathology: a case following a right parieto-occipital lesion is reported by Kölmel (1985). Equally it is arguable that two, if not all three, of the cases of ‘autoscopy’ described by Lunn, each with right hemisphere pathology, are not classic autoscopy and are heautoscopic in character (Lunn 1970, originally reported in Lunn 1948). On the other hand, Heydrich & Blanke (2013), make a case that heautoscopy is indeed associated with mainly left-sided, and autoscopy with right-sided, brain dysfunction. Similarly, Brugger and colleagues in their review of cases of ‘felt presence’ found that, in the 12 cases where there was a unilateral brain lesion, eight were in the left hemisphere and four in the right hemisphere. Of the total 31 cases, in 19 (61%) the ‘presence’ was lateralised to the right side of the body (Brugger, Regard & Landis 1996). Ultimately, Brugger and colleagues argue, in my view correctly, that the field is bedevilled by definitional problems, and that a new system of classification needs to be adopted (Brugger, Regard & Landis 1997).

82 Ehrenwald 1930.

83 Weinstein, Kahn, Malitz *et al* 1954; reporting Bechterev 1926, Chlenov 1934, Shmarian 1934, and Schenderov & Gamaleja 1935, respectively. (I have not been able to consult these papers, and they are consequently not listed in the bibliography.)

84 Hécaen & de Ajuriaguerra 1952 (205–8).

85 Halligan, Marshall & Wade 1993.

86 McGonigle, Hänninen, Salenius *et al* 2002.

87 Canavero, Bonicalzi, Castellano *et al* 1999.

88 Halligan & Marshall 1995.

89 Hari, Hanninen, Makinen *et al* 1998.

90 Srivastava, Taly, Gupta *et al* 2008.

91 Sellal, Renaseau-leclerc & Labrecque 1996.

92 Yoo, Kim, Jeong *et al* 2011.

93 Palmerini & Bogousslavsky 2012 (63).

94 Calder, Keane, Manes *et al* 2000. See also the fascinating case study in Salas, Radovic, Yuen *et al* 2014.

95 Bisiach 1997, 237–53.

96 Macdonald Critchley first described the condition: ‘perhaps it is more frequently found in patients with a left hemiplegia than with a right’ (1974). In the paper he describes five cases: four are described as ‘right hemisphere’, one as right temporoparietal. Kaplan-Solms & Solms 2000 (187–8) describe two cases: one right frontotemporoparietal, the other right temporoparietal. The case reported by van Stralen, van Zandvoort & Dijkerman (2011) is right frontoparietal; that of Moss & Turnbull (1996) is right temporoparietal; others are similar (Loetscher, Regard & Brugger 2006). Delgado & Bogousslavsky (2018) state that ‘the handful of cases of misoplegia described in the literature frequently presented a right hemispheric damage ... misoplegia is one of the ... self-awareness syndromes of the right hemisphere.’ Pearce (2007) finds that it is ‘most often the result of a right hemisphere lesion ... classically the inferior parietal lobule’. Two cases reported by Borah and colleagues of left limb self-mutilation exhibited right temporoparietal pathology (Borah, McConnell, Hughes *et al* 2016), and exhibit overlap with misoplegia: the authors speculate that right hemisphere damage may ‘release’ the left hemisphere, citing Shakya, Shyangwa, Pandey *et al* 2010, where left temporal seizures resulting in self-harm are reported. A condition of obsessive concern may represent a form of misoplegia, according to Kaplan-Solms & Solms (see above), and Bogousslavsky and colleagues, who report three right temporoparietal cases (Bogousslavsky, Kumral, Regli *et al* 1995), though the phenomena are somewhat diverse in nature. The latter authors make the point that not one of 13 patients with a ‘mirror’ infarct in the left hemisphere showed similar symptoms. However, Cutting found in his series of patients five cases relating to a right-sided limb and only two to a left-sided limb (Cutting 1978). The situation is made more complex by the fact that, as he acknowledges, depressive symptoms, which may mimic misoplegia, are commoner after left hemisphere stroke, leading to a potential overestimate; conversely many cases of left hemisphere stroke will be aphasic, leading to a potential underestimate. Bisiach describes patients taking a dislike for objects in the left visual field, and calls this ‘levophobia’: he considers misoplegia may be a subset of this (Bisiach 1997, 249). As Cutting astutely notes, whereas after a right hemisphere stroke, a limb is transformed into some alien, bizarre object, after a left hemisphere stroke (since the emotional depth of the right hemisphere is still available to the sufferer) the limb is more often merely absent and the area somehow replaced by grief or pain: there is an increase in emotion, and a decrease in ‘thingness’. However, this is in my view quite distinct from misoplegia. Consider these cases, all taken from Hécaen & de Ajuriaguerra 1952 (177, 179 & 186): (a) shrapnel wound to left frontoparietal region: ‘my right side is replaced by pain ... The half corresponding to the world is abolished’ – « *mon côté est remplacé par de la douleur ... la moitié correspondante du monde s’abolit* »; (b) left parietal angioma: patient reports ‘pain in the right hand ... the patient suddenly feels that he has no right hand ... he has a sense of oppression’ – « *douleurs de la main ... le malade a soudain l’impression qu’il n’a plus de main droite ... il a une sensation d’oppression* »; (c) left ‘centro-occipital’ epileptogenic focus: ‘as if there was a void, something vague on the right, it seems that on this side everything is distant, empty – « *comme s’il y avait du vide, du vague à droite, il me semble qu’à côté de moi tout est loin, vide* ».

97 Loetscher, Regard & Brugger 2006.

98 Borah, McConnell, Hughes and colleagues (2016) report a case of self-amputation related to right temporoparietal damage. On the preponderantly right hemisphere nature of the underlying pathology, see Hilti, Hänggi, Vitacco *et al* 2013; Hilti & Brugger 2010; Brang, McGeoch & Ramachandran 2008; McGeoch, Brang & Song 2011; and Blanke, Morgenthaler, Brugger *et al* 2009.

99 Dalby, Arboleda-Florez & Seland 1989.

100 See AB Joseph 1986a; and Alvarez, Puente, Blasco *et al* 2012, which demonstrates a possible connexion between koro and Cotard's syndrome, which, as we have seen, is highly dependent on right hemisphere damage or dysfunction.

101 Morgan, Dazzan, Morgan *et al* 2010; Harwood, Sultzer, Feil *et al* 2005; Ott, Lafleche, Whelihan *et al* 1996.

102 Morgan & David 2004; McEvoy, Hartman, Gottlieb *et al* 1996; Flashman & Roth 2004.

103 Marcel, Tegnér & Nimmo-Smith 2004.

104 Persinger & Makarec 1991; Lazure & Persinger 1992; Ahern, Herring, Tackenberg 1994; Bear & Fedio 1977.

105 See, eg, David 2004, esp 365 & 370.

106 Alloy & Abramson 1988; Birchwood, Iqbal, Chadwick *et al* 2000; Ghaemi & Rosenquist 2004, esp 110–1; Haaga & Beck 1995.

107 Alloy & Abramson 1979.

108 See McGilchrist 2009b (63–4).

109 Robinson & Price 1982.

110 Carson, MacHale, Allen *et al* 2000; for relation between left frontal lesions and depression, see McGilchrist 2009b, 62–4.

111 Bhogal, Teasell, Foley *et al* 2004.

112 Laures-Gore & Defife 2013.

113 Wei, Yong, Li *et al* 2015.

114 Caeiro, Ferro & Costa 2013.

115 Ahn, Lee, Jeong *et al* 2015; and see Berg, Palomäki, Lehtihalmes *et al* 2001.

116 Additionally, one of the effects of ECT is to increase right hippocampal connectivity (and size), and this correlates with improvement in depressive symptoms – see, eg, Abbott, Jones, Lemke *et al* 2014.

117 Skaf, Yamada, Garrido *et al* 2002.

118 Papageorgiou, Ventouras, Lykouras *et al* 2003.

119 Kornbrot, Msetfi & Grimwood 2013.

120 Stuss 1991b, 255–78; Wheeler, Stuss & Tulving 1997; Stuss, Picton & Alexander 2001.

121 McKay, Arciuli, Atkinson *et al* 2010.

122 Hecht 2013; Drake & Bingham 1985; Drake & Ulrich 1992; Schutz 2005; Stuss 1991a; Schacter, Glisky & McGlynn 1990.

123 Kakolewski, Crowson, Sewell *et al* 1999.

124 Drake & Seligman 1989.

125 Sharot 2011.

126 Sharot, Kanai, Marston *et al* 2012.

127 McKay, Tamagni, Palla *et al* 2013. The right hemisphere was stimulated by irrigating the left ear with iced water.

128 Regard & Landis 1994.

129 Ramachandran 1995; Gordon, Drenth, Jarvis *et al* 1978; Rausch 1985; Schutz 2005; Rourke 1989; Johnson & Myklebust 1967; Stuss 1991a; Stuss 1991b.

130 Mizuno 1991.

131 Marinsek, Turner, Gazzaniga *et al* 2014 (emphasis in original). See also Marcel, Tegnér & Nimmo-Smith 2004. House & Hodges (1988) report a woman who showed temporary insight immediately after being physically tested, but within five minutes had returned to denying her paralysis.

132 Panksepp 2003 (10: emphasis added).

133 Velichkovsky, Krotkova, Sharaev *et al* 2017.

134 *ibid* (emphasis added).

135 Marinsek, Turner, Gazzaniga *et al* 2014; Roser, Fugelsang, Dunbar *et al* 2005.

136 Schacter, Curran, Galluccio *et al* 1996; Curran, Schacter, Norman *et al* 1997.

137 Blackwood, Howard, ffytche *et al* 2000.

138 Gazzaniga 1998. See also Metcalfe, Funnell & Gazzaniga 1995; Phelps & Gazzaniga 1992; and Miller & Gazzaniga 1998.

139 ‘False memory syndrome’ involves memories of a traumatic experience, most frequently childhood sexual abuse, which are objectively false, but in which the person strongly believes. They are often associated with suggestion during certain kinds of therapy, and some may be factitious: the area is controversial. They have similarities with confabulation, which, as we have seen, is strongly related to right hemisphere impairment. Mendez & Fras (2011) hypothesise that ‘similar to confabulations, there is probable attenuation of a right VMPFC [right ventromedial prefrontal cortex] doubt tag’.

140 Curran, Schacter, Norman *et al* 1997; Moscovitch & Winocur 2002; Riege, Klane, Metter *et al* 1982.

141 Koutstaal, Wagner, Rotte *et al* 2001; Simons, Koutstaal, Prince *et al* 2003; Garoff, Slotnick & Schacter 2005; Kensinger, Garoff-Eaton & Schacter 2007.

142 Geeraerts, Lafosse, Vaes *et al* 2008.

143 Conway & Fthenaki 2003; Delbecq-Derouesne, Beauvois & Shallice 1990.

144 Rapcsak, Polster, Comer *et al* 1994; Rapcsak, Polster, Glisky M *et al* 1996; Riege, Klane, Metter *et al* 1982; Moran, Seidenberg, Sabsevitz *et al* 2005; Rapcsak, Nielsen, Littrell *et al* 2001.

145 Schacter, Curran, Galluccio *et al* 1996.

146 Bruell & Albee 1962.

147 Marchewka, Jednorog, Nowicka *et al* 2009.

148 Braun, Delisle, Guimond *et al* 2009. See also Kimura 1963a; Riege, Klane, Metter *et al* 1982; Moran, Seidenberg, Sabsevitz *et al* 2005; Conway & Fthenaki 2003; Rapcsak, Nielsen, Littrell *et al* 2001; and Podell, Lovell, Zimmerman *et al* 1995.

149 Bergert (2013) reports that in the relatively unusual cases where this is achieved by the left hemisphere, it appears to be a consequence of a decreased number of recognitions altogether – whether correct or incorrect. If you largely fail to recognise, you are bound to have a low rate of false recognition.

150 McGeorge, Beschin, Colnaghi *et al* 2007. Some researchers propose that this is because of the failure of the left hemisphere to make subtle discriminations, and to lump similar items together (De Renzi & Spinnler 1966; De Renzi, Faglioni & Villa 1977); others that it might be because the left hemisphere depends more on familiarity and the degree to which items could easily be coded in words (Kimura 1963a; Milner 1971).

151 Metcalfe, Funnell & Gazzaniga 1995; Phelps & Gazzaniga 1992. A study of evoked potentials in the brain (electrical activity in response to a stimulus) suggests that discrimination between false and true recognition may produce activity that is lateralised to the right hemisphere (Fabiani, Stadler & Wessels 2000).

152 Benton, Varney & Hamsher 1978; De Renzi, Faglioni & Villa 1977; Riege, Metter & Hanson 1980; Schwartz, Shipkin & Cermak 1979.

153 Bergert 2013.

154 Haramati, Soroker, Dudai *et al* 2008.

155 Martinaud, Pouliquen, Gérardin *et al* 2012.

156 Giammattei & Arndt 2012.

157 Rapcsak, Nielsen, Littrell *et al* 2001; Rapcsak, Reminger, Glisky *et al* 1999; Bartlett, Shastri, Abdi *et al* 2009.

158 Bellamy & Shillcock 2007; Ito 2001; Buratto, Zimmermann, Ferré *et al* 2014. The situation may be clarified by making a distinction not always made between right frontal and right temporal cortex. For the right hemisphere has its own internal control system, though it also acts as a brake on the left hemisphere. Much depends on whether the right frontal cortex is intact or not. For instance, a study of 17 patients with right temporal lobe damage showed that they could not recall faces seen (since that requires intact right temporal function), but at least didn't score false positives; whereas those with right frontal lobe damage showed the reverse pattern – faces could be recalled, because the right temporal cortex was functioning, but there were false positives, because the cautionary evaluation of the right frontal cortex was not. It is failure of frontal inhibitory control that leads to false beliefs and perceptions (Mendez 2006). This may also be why the right frontal lobe was activated whenever there was a false recognition in either right or left hemisphere: to make the mistake of interpreting the monitor coming into action as a *cause* would be like interpreting the activation of a sprinkler as the *cause* of a house-fire. The right frontal lobe is the monitor that is activated by any kind of discrepancy in a range of tasks.

159 Buratto, Zimmermann, Ferré *et al* 2014.

160 Bergert 2013. This theory would be in keeping with the findings of Jasper, Kunzler, Prichard *et al* 2014; and Christman, Propper & Dion 2004.

161 See, eg, Cimino, Verfaellie, Bowers *et al* 1991; Markowitsch, Calabrese, Neufeld *et al* 1999; Markowitsch, Calabrese, Fink *et al* 1997; Markowitsch, Calabrese, Haupts *et al* 1993; Markowitsch 1995; Phelps & Gazzaniga 1992; Metcalfe, Funnell & Gazzaniga 1995; Tulving, Kapur, Craik *et al* 1994; Schiffer, Zaidel, Bogen *et al* 1998.

162 Fink, Markowitsch, Reinkemeier *et al* 1996.

163 Levine, Black, Cabeza *et al* 1998.

164 Gazzaniga 2000.

165 Schultheiss, Yankova, Dirlikov *et al* 2009; Köllner & Schultheiss 2014; Rawolle, Schultheiss & Schultheiss 2013. I am indebted to Oliver Schultheiss for sharing his insights with me.

166 McClelland, Koestner & Weinberger 1989. See also Schultheiss 2008.

167 McClelland 1986.

- 168** Eliot, 'Burnt Norton', *Four Quartets*.
- 169** Pizzagalli, Lehmann & Brugger 2001; Leonhard & Brugger 1998.
- 170** Badzakova-Trajkov, Häberling & Corballis 2011; Duchêne, Graves & Brugger 1998; Fisher, Mohanty, Herrington *et al* 2004; Poreh, Whitman & Ross 1993; Weinstein & Graves 2002.
- 171** Bell, Reddy, Halligan 2007.
- 172** For a review, see Nicholls, Orr & Lindell 2005. See also Badzakova-Trajkov, Häberling & Corballis 2011.
- 173** Eckblad & Chapman 1983.
- 174** Diduca & Joseph 1997.
- 175** Antonova, Amaratunga, Wright *et al* 2016.
- 176** Schofield & Mohr 2014.
- 177** Gooding, Matts & Rollmann 2006.
- 178** Iwata 1989.
- 179** Linscott, Marie, Arnott *et al* 2006.
- 180** Horton 1967 (171).
- 181** Subbotsky 2001.
- 182** Subbotsky & Quinteros 2002.
- 183** *ibid.*
- 184** Subbotsky 2005.
- 185** Subbotsky 2014.
- 186** Subbotsky 2007; Subbotsky 2010.
- 187** Rozin, Markwith & Ross 1990.
- 188** Nemeroff & Rozin 1994; Nemeroff & Rozin 2000. See also Rozin & Nemeroff 2002.
- 189** Pronin, Wegner, McCarthy *et al* 2006.
- 190** Subbotsky 2014.
- 191** Hutson 2008.
- 192** Rogers, Everitt, Baldacchino *et al* 1999; Rogers, Owen, Middleton *et al* 1999; Rubinsztein, Fletcher, Rogers *et al* 2001.
- 193** Tranel, Bechara & Denburg 2002; Manes, Sahakian, Clark *et al* 2002.
- 194** Ersche, Fletcher, Lewis *et al* 2005.
- 195** Sutterer, Koscik & Tranel 2015; Reber & Tranel 2017; Tranel, Damasio, Denburg *et al* 2005.
- 196** Cahill, Uncapher, Kilpatrick *et al* 2004; Schneider, Peters, Bromberg *et al* 2011; Canli, Desmond, Zhao *et al* 2002.
- 197** De Vries 2004.
- 198** Schuepbach, Skotchko, Duschek *et al* 2012; Wisniewski 1998. For a fascinating review of sex differences in the brain, see Cahill 2006.
- 199** See, eg, Tian, Wang, Yan *et al* 2011; McGlone 1980; Inglis & Lawson 1981; Corballis & Sidey 1993; Juárez & Corsi-Cabrera 1995; Cory-Slechta, Weston, Liu *et al* 2013; Shaywitz, Shaywitz, Pugh *et al* 1995; Voyer 1996; Hausmann & Güntürkün 1999; Meinschaefer, Hausmann & Güntürkün 1999; Rasmjou, Hausmann & Güntürkün 1999; Hausmann, Ergun, Yazgan *et al* 2002; Hausmann, Waldie & Corballis 2003; and Liu, Stufflebeam, Sepulcre *et al* 2009.

- 200** Voyer 1996; Hiscock, Perachio & Inch 2001; Voyer 2011; Hausmann 2017; and Cahill 2006.
- 201** See, eg, Ashton & McFarland 1991; Sommer, Aleman, Bouma *et al* 2004; Schlosser, Hutchinson, Joseffer *et al* 1998.
- 202** Lansdell 1961; McGlone 1977; McGlone 1978; McGlone & Kertesz 1973.
- 203** Ingallhalikar, Smith, Parker *et al* 2014.
- 204** See, eg, Russo, Persegani, Papeschi *et al* 2000; Koles, Lind & Flor-Henry 2010; Vikingstad, George, Johnson *et al* 2000; Miller, Jayadev, Dodrill *et al* 2005.
- 205** Language: see, eg, Bryden 1979; Witelson, Beresh & Kigar 2006; Franzon & Hugdahl 1986; Shaywitz, Shaywitz, Pugh *et al* 1995; working memory: Speck, Ernst, Braun *et al* 2000; Bell, Willson, Wilman *et al* 2006; Ramos-Loyo & Sanchez-Loyo 2011; spatial orientation: see, eg, Johnson, McKenzie & Hamm 2002; Rilea, Roskos-Ewoldsen & Boles 2004; Witelson 1976; Chiarello, McMahon & Schaefer 1989; Corballis & Sidey 1993; Li 2014; Dabbs, Chang, Strong *et al* 1998; Galea & Kimura 1993; Lawton, Charleston & Zieles 1996; Barkley & Gabriel 2007; Voyer & Bryden 1990; spatial attention: Hausmann, Ergun, Yazgan *et al* 2002; Müller-Oehring, Schulte, Raassi *et al* 2007; Razumnikova & Vol'f, 2011; Hatta, Ohnishi & Ogura 1982; face perception: Rizzolatti & Buchtel 1977; Borod & Koff 1983; Killgore & Yurgelun-Todd 2001; Tiedt, Weber, Pauls *et al* 2013; Proverbio, Riva, Martin 2010; Proverbio, Brignone, Matarazzo 2006; Bourne 2005; Nikolaenko 2005; creativity tasks: (verbal): Fink & Neubauer 2006; (musical): Hassler & Nieschlag 1989; emotion: Grimshaw, Bryden & Finegan 1995; Cahill, Uncapher, Kilpatrick *et al* 2004; Schneider, Peters, Bromberg *et al* 2011; Lee, Liu, Hoosain *et al* 2002; Wager, Phan, Liberzon *et al* 2003; Tranel, Damasio, Denburg *et al* 2005; appreciation of beauty: Cela-Conde, Ayala, Munar *et al* 2009.
- 206** Kimura 1969.
- 207** Frings, Wagner, Unterrainer *et al* 2006; McGlone & Kertesz 1973.
- 208** Sandstrom, Kaufman & Huettel 1998; Ramos-Loyo & Sanchez-Loyo 2011; Pletzer, Kronbichler, Nuerk *et al* 2013. However, in chicks, while the left hemisphere, as in humans, deals with the local, and the right hemisphere with the global, at least one study suggests that male chicks appear to rely more on left hemisphere landmarks, rather than right hemisphere geometrics (Tommasi & Vallortigara 2004).
- 209** Nowicka & Fersten 2001; Moes, Brown & Minnema 2007.
- 210** Pletzer, Kronbichler, Nuerk *et al* 2013; Pletzer 2014. See also Nikolaenko 2005.
- 211** Lee, Chung, Chang *et al* 2012.
- 212** Scheuringer & Pletzer 2016; Roalf, Lowery & Turetsky 2006.
- 213** Pletzer, Petasis & Cahill 2014.
- 214** Cahill, Gorski, Belcher *et al* 2004; Cahill & van Stegeren 2003; Cahill, Uncapher, Kilpatrick *et al* 2004.
- 215** Waber 1979 (173 & 176).
- 216** Kramer, Ellenberg, Leonard *et al* 1996.
- 217** Hassler & Nieschlag 1989.
- 218** Carne, Vogrin, Litewka *et al* (2006) found a significant effect in both sexes. Savic & Lindström (2008) found the effect only in heterosexual males and homosexual women. There is an overall trend to find that this effect is more marked in men, but there are many variables, and the area is not easy to interpret.
- 219** Kong, Mathias, Guadalupe *et al* 2018; Koelkebeck, Miyata, Kubota *et al* 2014.

- 220** Geschwind & Galaburda 1985; Stewart & Kolb 1988.
- 221** Chura, Lombardo, Ashwin *et al* 2010.
- 222** Lombardo, Ashwin, Auyeung *et al* 2012.
- 223** Nguyen, McCracken, Ducharme *et al* 2013.
- 224** Harasty, Double, Halliday *et al* 1997.
- 225** Grimshaw, Bryden & Finegan 1995.
- 226** Kimura 1963b.
- 227** Overall: Pelvig, Pakkenberg, Stark *et al* 2008; Oliveira-Pinto, Andrade-Moraes, Oliveira *et al* 2016. Right greater than left: Rabinowicz, Dean, Petetot *et al* 1999.
- 228** Rabinowicz, Petetot, Gartside *et al* 2002.
- 229** See, eg, Beking, Geuze, van Faassen *et al* 2018.
- 230** Halpern, Benbow, Geary *et al* 2007.
- 231** Diamond, Johnson & Ingham 1975.
- 232** For an overview of the complexities, see Celec, Ostatníková & Hodosy 2015.
- 233** Fascinatingly, Kimura (1992) found that higher levels of testosterone in women masculinised the neuropsychological profile, eg, improved visuo-spatial skills, as might be expected; but that in men lower levels of testosterone were associated with excellence in such skills.
- 234** Pletzer, Petasis & Cahill 2014.
- 235** Tranel, Damasio, Denburg *et al* 2005.
- 236** Goel 2007.
- 237** Langdon & Warrington 2000; Adolphs, Tranel, Bechara *et al* 1996; Goel, Shuren, Sheesley *et al* 2004.
- 238** Sass & Pienkos 2013a (649).
- 239** Minkowski 2002 (99): « *Le fou ‘déraisonne’ bien moins souvent qu’on ne le croit, peut-être même ne déraisonne-t-il jamais* ».
- 240** Chesterton 1909 (30).
- 241** Gazzaniga 2000.
- 242** Wolford, Miller & Gazzaniga 2000.
- 243** Corballis 2003.
- 244** For a useful overview of these problems, see Heit 2015.
- 245** Taleb 2008.
- 246** Parsons & Osherson 2001.
- 247** Luchins 1942; Luchins & Luchins 1950.
- 248** Pope, Fagot, Meguerditchian *et al* 2018.
- 249** Slusher & Anderson 1996.
- 250** Incidentally, it seems likely that induction and deduction involve distinct areas of the left frontal cortex, deduction preferentially activating the inferior frontal gyrus, and induction the dorsolateral prefrontal gyrus (Goel & Dolan 2004).
- 251** Wilkins 1928; Evans, Barston & Pollard 1983.

- 252** Huq, Garety & Hemsley 1988; Dudley, John, Young *et al* 1997; Conway, Bollini, Graham *et al* 2002; Moritz & Woodward 2005; Warman, Lysaker, Martin *et al* 2007.
- 253** Roser, Fugelsang, Dunbar *et al* 2005.
- 254** Kroger, Nystrom, Cohen *et al* 2008.
- 255** Goel, Buchel, Frith *et al* 2000; Goel & Dolan 2003; Goel 2007; Menenti, Petersson, Scheeringa *et al* 2009; Stollstorff, Vartanian & Goel 2012.
- 256** Stollstorff, Vartanian & Goel 2012; Kroger, Nystrom, Cohen *et al* 2008.
- 257** Deglin & Kinsbourne 1996.
- 258** Goel 2007.
- 259** Tsujii, Masuda, Akiyama *et al* 2010; Tsujii & Watanabe 2009.
- 260** Goel, Stollstorff, Nakic *et al* 2009.
- 261** Tsujii, Masuda, Akiyama *et al* 2010; and see McGilchrist 2009b (193).
- 262** Goel, Buchel, Frith *et al* 2000; Prado & Noveck 2007.
- 263** Goel & Dolan 2003.
- 264** Goel 2007. See, eg, Caramazza, Gordon, Zurif *et al* 1976; Fink, Marshall, Halligan *et al* 1999; Goel, Buchel, Frith *et al* 2000; Goel & Dolan 2003; Stavy, Goel, Critchley *et al* 2006.
- 265** Goel, Buchel, Frith *et al* 2000; Goel & Dolan 2003; Prado & Noveck 2007; Fink *et al*, *op cit* 1999.
- 266** Ramachandran 2005 (141); see also Fink, Marshall, Halligan *et al* 1999.
- 267** Ramachandran 1996.
- 268** Tsujii, Okada & Watanabe 2010; Meudell & Greenhalgh 1987.
- 269** Ramachandran 1994, 1995.
- 270** Funk & Pettigrew 2003.
- 271** https://en.wikipedia.org/wiki/Motion-induced_blindness.
- 272** Whitfield 2001.
- 273** Marinsek, Turner, Gazzaniga *et al* 2014.
- 274** Konishi, Hayashi, Uchida *et al* 2002.
- 275** Corlett, Murray, Honey *et al* 2007.
- 276** Caramazza, Gordon, Zurif *et al* 1976.
- 277** Goel, Tierney, Sheesley *et al* 2007.
- 278** Rausch 1977.
- 279** Marinsek, Turner, Gazzaniga *et al* 2014.
- 280** Goel & Vartanian 2005.
- 281** Rausch 1977; Vartanian & Goel 2005.
- 282** Kroger, Nystrom, Cohen *et al* 2008.
- 283** Goel, Tierney, Sheesley *et al* 2007.
- 284** Osherson, Perani, Cappa *et al* 1998; Parsons & Osherson 2001.
- 285** Goel, Tierney, Sheesley *et al* 2007.
- 286** Chernigovskaya 1999.
- 287** Goel, Stollstorff, Nakic *et al* 2009 (emphasis added).

- 288** Johnson-Laird 1995.
- 289** Caramazza, Gordon, Zurif *et al* 1976; Read 1981.
- 290** Knauff, Fangmeier, Ruff *et al* 2003; Grossman 1982; Grossman & Haberman 1987; Caramazza, Gordon, Zurif *et al* 1976; Hier & Kaplan 1980.
- 291** Brownell, Potter, Bihle *et al* 1986.
- 292** Miller, Sinnott-Armstrong, Young *et al* 2010.
- 293** Goel, Vartanian, Bartolo *et al* 2013.
- 294** Parsons & Osherson 2001; Houdé, Zago, Crivello *et al* 2001.
- 295** Goel 2007.
- 296** Prado, Chadha & Booth 2011; Acuna, Eliassen, Donoghue *et al* 2002.
- 297** Parsons & Osherson 2001; Bowden & Jung-Beeman 2003; Kounios, Fleck, Green *et al* 2008; Sandkühler & Bhattacharya 2008.
- 298** Lane & Schooler 2004; Dodson, Johnson & Schooler 1997; Wilson & Schooler 1991; Schooler & Engstler-Schooler 1990.
- 299** Parsons & Osherson 2001.
- 300** Babcock & Vallesi 2015.
- 301** Monti, Parsons & Osherson 2012; Monti, Parsons & Osherson 2009.
- 302** Ribeiro, Mansur & Radanovic 2015 (emphasis added).
- 303** Anagnostopoulos, Spiegel, Palmer *et al* 2013.
- 304** Pross 2012 (44).
- 305** Beeman 1993; Brownell, Potter, Bihle 1986; Caplan & Dapretto 2001; Robertson, Gernsbacher, Guidotti *et al* 2000; and St George, Kutas, Martinez *et al* 1999; for a useful review, see Ferstl 2007.
- 306** Chow, Kaup, Raabe *et al* 2008; Ferstl & von Cramon 2001; Kuperberg, Lakshmanan, Caplan *et al* 2006.
- 307** Braun & Suffren 2011.
- 308** Kroger, Nystrom, Cohen *et al* 2008.
- 309** Fabiani, Stadler & Wessels 2000; Evans & Federmeier 2007; Metcalfe, Funnell & Gazzaniga 1995; Marsolek 1999; Marsolek, Kosslyn & Squire 1992.
- 310** Evans & Federmeier 2007; Bihle, Brownell, Powelson *et al* 1986; Coulson & Williams 2005; Coulson & Wu 2005.
- 311** Kirsner 1980.
- 312** McElroy & Stroh 2013.
- 313** Chatham, Claus, Kim *et al* 2012; Aron, Robbins & Poldrack 2014.
- 314** Johnson-Laird 1995.
- 315** Goel 2007. Nonetheless the left hemisphere can overcome bias when it is dealing with arbitrary material that has no real world counterpart. Houdé, Zago, Mellet *et al* (2000) trained participants to find falsifying cases of a complex conditional rule with a negative antecedent, such as: ‘if there is not a blue triangle then there is a red circle’. The training involved teaching subjects to overcome the perceptual matching bias inherent in the task. Thus, as the authors say, ‘this task requires subjects to get beyond perceptual “traps” and know how to falsify conditionals’. They found a shift in neural activity from bilateral posterior regions in the ‘perceptual’ condition to a left frontal network after

training on the conditional falsification task (see also Houdé, Zago, Crivello *et al* 2001; and Houdé & Tzourio-Mazoyer 2003).

316 Gazzaniga 1998.

317 Marinsek, Turner, Gazzaniga *et al* 2014.

318 Wolford, Miller & Gazzaniga 2000.

319 Yellott 1969.

5. APPREHENSION

1 *Tao Te Ching*, §64 (trans S Mitchell).

2 Rothschild 1930 (466: emphasis in original): » ... [eine] Verschiedenheit, die ein Ausdruck der allerursprünglichsten Lebensstatsache, des Gegenüber, der Zweiheit oder besser der Polarität von Individuum und Welt darstellt. Die linke Seite des Leibes dient mehr als Aufnahme- und Wirkungsstätte des Fremden, die rechte Seite mehr den aus der Individualität herauswachsenden aktiven Lebensäußerungen. Die Polarität von Individuum und Kosmos hat eine Entsprechung in der Polarität von rechts und links, das ist der Sinn, den wir in der Organisation des Leibes glauben sehen zu können «.

3 Fadiga & Craighero 2006.

4 Rauscher, Krauss & Chen 1996; Rimé, Schiaratura, Hupet *et al* 1984.

5 Kinsbourne 1978 (553).

6 Ramachandran 1993.

7 Parallels exist in most languages: see McGilchrist 2009b (112ff).

8 Described by Joseph Lange (Brown 1988, 150).

9 Morlaas 1988.

10 Rumati 2005; Goldenberg & Hagmann 1998; De Renzi & Lucchelli 1988; Rumati, Zanini, Vorano *et al* 2001.

11 Hartmann, Goldenberg, Daumüller *et al* 2005; Schwartz, Buxbaum, Montgomery *et al* 1999.

12 Goldberg, Mayer & Toglia 1981.

13 Shahani, Burrows & Whitty 1970.

14 McNabb, Carroll & Mastaglia 1988.

15 Gonzalez, Ganel & Goodale 2006.

16 Gitelman, Alpert, Kosslyn *et al* 1996. See also: Desmedt 1977; and Stoeckel, Weder, Binkofski *et al* 2004.

17 Forrester, Leavens, Quaresmini *et al* 2011; Forrester, Quaresmini, Leavens *et al* 2012; Zhao, Wang, Han *et al* 2015.

18 Zajkowski, Kossut & Wilson 2017.

19 See McGilchrist 2009b (Chapter 3); and McGilchrist 2018.

20 Chernigovskaya 1999; Deglin 1993.

21 See McGilchrist 2009b (119); Berlin 1992; Berlin 2005; Ramachandran & Hubbard 2001.

22 An account quoted verbatim and at length by Joseph Lange (Brown 1988, 145).

23 Shibahara & Lucero-Wagoner 2002. For reviews of right hemisphere language, see Beeman & Chiarello 1998; Joanne, Goulet & Hannequin 1990.

24 Campbell, Landis & Regard 1986.

25 Bellugi, Poizner & Klima 1983.

26 Bellugi, Poizner & Klima 1989; Gentilucci, Bernardis, Crisi *et al* 2006.

27 Benton 1961; Critchley 1966.

- 28** McKinley, Dempster & Gormley 2015; Hannay, Ciaccia, Kerr *et al* 1990.
- 29** Maki, Grandy & Hauge 1979.
- 30** Braun, Desjardins, Gaudet *et al* 2007.
- 31** Braun, Desjardins, Gaudet *et al* 2007. A case of autotopagnosia atypically following a right hemisphere lesion involved a patient who was also right hemisphere-dominant for language, and whose brain may have been anomalously lateralised (Denes, Cappelletti, Zilli *et al* 2000).
- 32** De Renzi & Scotti 1970 (223).
- 33** Denes, Cappelletti, Zilli *et al* 2000.
- 34** De Renzi & Scotti 1970.
- 35** Semenza 1988; Guariglia, Piccardi, Puglisi Allegra *et al* 2002.
- 36** Engerth 1933. The case report referred to above (Guariglia *et al* 2002) is unique thus far, given the left hemisphere lesion: the subject's performances 'were particularly defective on tests relying on visuo-spatial body representation, but her semantic and linguistic knowledge about body and body parts were spared', which is the mirror inverse of the normal situation, and it would be hard to draw much in the way of reliable conclusions from it. For the record, she was right-handed.
- 37** Lange 1988 (84–5).
- 38** Charles, Sahraie & McGeorge 2007; Fontenot 1973; Nicholls, Bradshaw & Mattingley 1999; Luh 1995; Zorzi, Priftis & Umiltà 2002; McGlone & Davidson 1973.
- 39** Funnell, Colvin & Gazzaniga 2007; Dehaene 1997 (177–85).

6. EMOTIONAL AND SOCIAL INTELLIGENCE

1 Herder 1828 (52): » *Ein Mensch, der allein Kopf seyn will, ist so ein Ungeheuer, als der allein Herz seyn will* «.

2 Gurin & Blum 2017.

3 Simeon, Guralnik, Hazlett *et al* 2000.

4 Sierra, Nestler, Jay *et al* 2014.

5 Daniels, Gaebler, Lamke *et al* 2015.

6 Irle, Lange, Weniger *et al* 2007.

7 Schlumpf, Reinders, Nijenhuis *et al* 2014.

8 Ohara, Nishii, Nakajima *et al* 2004.

9 Kas, Lavault, Habert *et al* 2014. Another patient in which the sense of reality was not the primary disturbance showed bilateral deficits (Landtblom, Dige, Schwerdt *et al* 2002).

10 ‘Focal unilateral limbic seizure activity in the depth’ interferes with the cognitive functions of the hemisphere involved, even when unnoticed clinically or undetectable on the surface EEG, provided that epileptiform EEG activity lasts for several seconds; and ‘this interference is specific to the “dominant” processing of the discharging hemisphere’ (Regard, Cook, Wieser *et al* 1994).

11 Koles, Lind & Flor-Henry 2004; Flor-Henry, Lind & Koles 2004; Gruzelier 1973; Gruzelier & Venables 1974. (NB in the case of both the Gruzelier studies here cited consideration should be given to the comments of Shimkunas (1978, 210–11), which suggest that Gruzelier may have partly misinterpreted his own findings.)

12 Maier, Mellers, Toone *et al* 2000; Flor-Henry 1969a; Flor-Henry 1969b; Gallhofer, Trimble, Frackowiak *et al* 1985. See Trimble 2007 for a fascinating overview of this area.

13 Mullan & Penfield 1959.

14 Devinsky, Putnam, Grafman *et al* 1989.

15 This is a case reported by Harvey Cushing (1922: ‘case 5’, 364–7). A case reported by Cushing’s colleague Gilbert Horrax would appear to refer to the same individual (Horrax 1923, 543).

16 This case is reported by Macdonald Critchley, who states the side to be unverified, although he thought it was most likely to be left-sided (1951). Cutting (2011) does report one other case, but the subject in that case had a right frontal tumour as well as a left parietal tumour (see Critchley *op cit*).

17 McKinnell 2017 (location 190, 222).

18 Fischer, Perez, Prasad *et al* 2016.

19 Ezura, Kakisaka, Jin *et al* 2015; Vlasov, Chervyakov & Gnezditskii 2013; Gainotti 2007; Cutting & Silzer 1990; Weinand, Hermann, Wyler *et al* 1994. A patient at operation whose exposed right posterior inferior temporal region was stimulated by Wilder Penfield reported: ‘Just a tiny flash of a feeling of familiarity and a feeling that I knew everything that was going to happen in the near future’ (Penfield 1975, 25).

20 Cutting 2011 (174).

21 See Moulin, Conway, Thompson *et al* 2005.

22 Vignal, Maillard, McGonigal *et al* 2007.

23 Vlasov, Chervyakov & Gnezditskii 2014.

24 Murai & Fukao 2003.

25 Labate, Cerasa, Mumoli *et al* 2015; Brandt, Conway, James *et al* 2018.

26 Sacks 1986 (78).

27 Harmon-Jones 2004, 2007; Harmon-Jones & Allen 1998; Stewart, Levin-Silton, Sass *et al* 2008; Wacker, Heldmann & Stemmler 2003; Gidron, Gaygısiz, Lajunen *et al* 2014.

28 Hypomania and mania: ‘A review of reported cases reveals that most focal lesions associated with secondary mania involve the diencephalic region and that the majority of lateralized lesions are on the right side’ (Cummings & Mendez 1984). This has been borne out by many subsequent studies: Robinson, Boston, Starkstein *et al* 1988; Cutting 1990; Kulisevsky, Berthier & Pujol 1993; Cummings 1997; Vuilleumier, Ghika-Schmid, Bogousslavsky *et al* 1998; Braun, Larocque, Daigneault *et al* 1999; Blumberg, Stern, Martinez *et al* 2000; Carran, Kohler, O’Connor *et al* 2003; Dodson 2004; Braun, Daigneault, Gaudelet *et al* 2008; Belyi 1985. In one case a patient was scanned before and after a right hemisphere infarct: ‘comparison of pre- and poststroke SPECT scans demonstrated a unique pattern of left orbitofrontal hyperperfusion, with extensive right frontal hypoperfusion only after the stroke, during the manic episode’ (Mimura, Nakagome, Hirashima *et al* 2005, 263). Not all researchers are in agreement, however: see, eg, Bearden, Hoffman & Cannon 2001; and Caligiuri, Brown, Meloy *et al* 2004. A patient scanned during an episode of mania induced by deep brain stimulation showed clear activation of the right dorsolateral prefrontal and inferior temporal cortex, as well as of the left anterior cingulate cortex, and deactivation of the left insula (Ulla, Thobois, Lemaire *et al* 2006); and similar findings have been made in similar experimental conditions, with activations in the left thalamus, but also in the right middle and inferior temporal gyrus, right inferior parietal gyrus and right inferior frontal gyrus, and deactivation in the left posterior middle temporal and occipital gyrus, left middle frontal gyrus, bilateral cuneus and right medial prefrontal/anterior cingulate gyrus (Mallet, Schüpbach, N’Diaye *et al* 2007). Sadness: Asthana & Mandal 2001; Robinson & Price 1982; Schiffer, Zaidel, Bogen *et al* 1998. Sadness and empathy are highly correlated: this can be seen in studies of children and adolescents (see, eg, Rothbart, Ahadi & Hershey 1994). Children and adolescents with psychopathic tendencies have difficulty recognising sad faces (Blair & Coles 2000; Blair, Colledge, Murray *et al* 2001) and sad vocal tones (Stevens, Charman & Blair 2001). Reparative behaviour and sadness are highly correlated in childhood (Cole, Barrett & Zahn-Waxler 1992). There is also a direct correlation between sadness and empathy, on the one hand, and feelings of guilt, shame and responsibility, on the other (Zahn-Waxler & Robinson 1995). See also McGilchrist 2009b (63ff), for further discussion and references.

29 See, eg, Rothbart, Ahadi & Hershey 1994; Tullett, Harmon-Jones & Inzlicht 2012.

30 Blair, Colledge, Murray *et al* 2001; Blair & Coles 2000; Stevens, Charman & Blair 2001.

31 Zahn-Waxler & Robinson 1995; Cole, Barrett & Zahn-Waxler 1992.

32 Heilman, Schwartz & Watson 1978; Morrow, Vrtunski, Kim *et al* 1981.

33 Avicenna, ‘On the signs of melancholy’s appearance’, in *On Black Bile and Melancholy*, from the *Canon of Medicine*, III; as quoted in Radden 2000 (77).

34 Mandal & Ambady 2004; Thomas, Wignall, Loetscher *et al* 2014; Borod, Haywood & Koff 1997; Hugdahl, Iversen & Johnsen 1993; Moreno, Borod, Welkowitz *et al* 1990.

35 Indersmitten & Gur 2003.

36 Nagy, Ákos, Biro *et al* 2010. For those who are wondering how this can work in an entirely symmetrical relationship, the authors suggest that ‘hierarchical organisation of group flight may be more efficient than an egalitarian one, at least for those flock sizes that permit regular pairwise

interactions among group members, during which leader-follower relationships are consistently manifested.'

37 Templeton, McCracken, Sher *et al* 2014; Templeton, Mountjoy, Pryke *et al* 2012; George, Hara & Hessler 2006.

38 Bisazza, Pignatti & Vallortigara 1997a; Bisazza, Pignatti & Vallortigara 1997b; Bisazza, Facchin, Pignatti *et al* 1998.

39 Sakai, Hishii, Takeda *et al* 2006.

40 Hill, Guarino, Calvillo *et al* 2017.

41 Giljov, Karenina & Malashichev 2018.

42 Vallortigara & Andrew 1991.

43 Kaminski, Tempelmann, Call *et al* 2009; Leavens & Hopkins 1999; Miklósi & Soproni 2006; Okamoto-Barth, Call & Tomasello 2007; Pack & Herman 2007; Udell & Wynne 2008.

44 Gopnik & Meltzoff 2006; Ritblatt 2000.

45 Baron-Cohen, Leslie & Frith 1985.

46 Siegal, Carrington & Radel 1996.

47 Yeh & Tsai 2014; Decety & Lamm 2007; Scholz, Triantafyllou, Whitfield-Gabrieli *et al* 2009.

48 Saxe, Carey & Kanwisher 2004; Saxe & Wexler 2005.

49 Decety & Lamm 2007.

50 Ortigue, Sinigaglia, Rizzolatti *et al* 2010.

51 Liepelt, Von Cramon & Brass 2008; Ortigue, King, Gazzaniga *et al* 2009; Rizzolatti & Sinigaglia 2008.

52 Narayan, Narr, Kumari *et al* 2007.

53 Herbet, Lafargue, Moritz-Gasser *et al* 2015.

54 Tullett, Harmon-Jones & Inzlicht 2012; Toller, Adhimoolam, Rankin *et al* 2015; Reniers, Völlm, Elliott *et al* 2014.

55 Mai, Zhang, Hu *et al* 2016; Hétu, Taschereau-Dumouchel & Jackson 2012; De Greck, Wang, Yang *et al* 2012; Perry, Rosen, Kramer *et al* 2001.

56 Herbet, Lafargue, Moritz-Gasser *et al* 2015.

57 Lebel, Gee, Camicioli *et al* 2012.

58 Park, Westin, Kubicki *et al* 2004.

59 Olson, von der Heide, Alm *et al* 2015.

60 Pugliese, Catani, Ameis *et al* 2009; Thomas, Humphreys, Jung *et al* 2010.

61 Kubicki, Westin, Maier *et al* 2002; Ellison-Wright & Bullmore 2009; Whitford, Kubicki, Ghorashi *et al* 2011.

62 Ratcliffe 2006 (31: emphasis added).

63 Rosen, Allison, Schauer *et al* 2005; Perry, Rosen, Kramer *et al* 2001.

64 Schutz 2005.

65 Schore 1994 (125). Schore notes incidentally that the right orbitofrontal cortex is larger in infant rats, though other areas of frontal cortex are larger on the left (van Eden, Uylings & van Pelt 1984).

66 Decety & Chaminade 2003 (591).

- 67** Jackson, Brunet, Meltzoff *et al* 2006. See also Shamay-Tsoory, Tomer, Berger *et al* 2003; Rankin, Gorno-Tempini, Allison *et al* 2006; Spinella 2002.
- 68** See McGilchrist 2009b (esp 247–56 & 281–2).
- 69** Aziz-Zadeh, Koski, Zaidel *et al* 2006.
- 70** Biermann-Ruben, Kessler, Jonas *et al* 2008.
- 71** Bonda, Petrides, Ostry *et al* 1996.
- 72** Grossman, Donnelly, Price *et al* 2000.
- 73** Naito, Roland, Grefkes *et al* 2005.
- 74** Dumas, Nadel, Soussignan *et al* 2010. For a full discussion of related issues, see Schore 2020.
- 75** Ortigue, King, Gazzaniga *et al* 2009.
- 76** Hamilton & Grafton 2008.
- 77** Ortigue, Thompson, Parasuraman *et al* 2009.
- 78** Hamilton, Brindley & Frith 2007; Southgate & Hamilton 2008.
- 79** Ortigue, Sinigaglia, Rizzolatti *et al* 2010.
- 80** Keenan, Rubio, Racioppi *et al* 2005 (702).
- 81** Panksepp 1998 (302).
- 82** See, eg, Blonder, Bowers & Heilman 1991; Blonder, Burns, Bowers *et al* 1993.
- 83** Brancucci, Lucci, Mazzatenta *et al* 2009.
- 84** Gainotti 2012.
- 85** Harms, Reese & Elias 2014.
- 86** Adolphs, Damasio, Tranel *et al* 1996.
- 87** Koeda, Takahashi, Yahata *et al* 2006; Koeda, Takahashi, Yahata *et al* 2007.
- 88** Lattner, Meyer & Friederici 2005; Belin, Zatorre, Lafaille *et al* 2000; Riley & Sackeim 1982; von Kriegstein, Eger, Kleinschmidt *et al* 2003.
- 89** George, Parekh, Rosinsky *et al* 1996; Wildgruber, Pihan, Ackermann *et al* 2002; Mitchell, Elliott, Barry *et al* 2003; Ross 1981; Heilman, Bowers, Speedie *et al* 1984.
- 90** Van Lancker & Kreiman 1987; Peretz, Kolinsky, Tramo *et al* 1994.
- 91** Mitchell, Elliott, Barry *et al* 2004.
- 92** Meyer, Baumann, Wildgruber *et al* 2007; Meyer, Zysset, von Cramon *et al* 2005; Sander & Scheich 2001.
- 93** Carmon & Nachshon 1973; Haggard & Parkinson 1971; King & Kimura 1972.
- 94** See McGilchrist 2009b (62–3).
- 95** Brancucci, Lucci, Mazzatenta *et al* 2009; Zald & Pardo 2000; Anderson, Christoff, Stappen *et al* 2003; Zatorre, Jones-Gotman & Rouby 2000; Gottfried, O’Doherty & Dolan 2002; Herz, McCall & Cahill 1999; Dijksterhuis, Møller, Bredie *et al* 2002.
- 96** Friedman & Förster 2005.
- 97** Hagemann, Naumann, Lürken *et al* 1999.
- 98** Fox, Yih, Racciah *et al* 2018.
- 99** Hauser & Akre 2001; Innes, Burt, Birch *et al* 2016; Christman & Hackworth 1993.

100 Gainotti 2006 (159). For reviews, see Gainotti 2001, and Gainotti 2003. See also Nicholls, Ellis, Clement *et al* 2004, which demonstrates that emotional expressions are under principally right hemisphere control, regardless of whether they are happy, sad or neutral.

101 Bourne 2010.

102 Velichkovsky, Krotkova, Sharaev *et al* 2017.

103 *ibid.*

104 Nijboer & Jellema 2012.

105 McKinnell 2017.

106 Salas, Radovic, Yuen *et al* 2014.

107 For more detail, see McGilchrist 2009b (62–4).

108 Barton & Cherkasova 2003.

109 Salva, Regolin, Mascialzoni *et al* 2012. See also Bourne 2010; Bradshaw & Nettleton 1981; Burt & Perrett 1997; Christman & Hackworth 1993; Coolican, Eskes, McMullen *et al* 2008; De Renzi, Perani, Carlesimo *et al* 1994; Finlay & French 1978; Geffen, Bradshaw & Wallace 1971; Hellige, Bloch, Cowin *et al* 1994; Hilliard 1973; Innes, Burt, Birch *et al* 2016; Kanwisher, Chun, McDermott *et al* 1996; Kanwisher, Tong & Nakayama 1998; Levy, Heller, Banich *et al* 1983b; Luh, Rueckert & Levy 1991; Schwartz & Smith 1980; Sargent 1982a; Watling & Bourne 2013; Workman, Chilvers, Yeomans *et al* 2006; Workman, Peters & Taylor 2000; Worley & Boles 2016.

110 Lindell 2013; Salva, Regolin, Mascialzoni *et al* 2012; Peirce, Leigh & Kendrick 2000.

111 Guo, Meints, Hall *et al* 2009.

112 Pinsk, DeSimone, Moore *et al* 2005.

113 Hamilton & Vermeire 1988; Vermeire & Hamilton 1998; Vermeire, Hamilton & Erdmann 1998.

114 Weintraub & Mesulam 1983; Manoach, Sandson & Weintraub 1995.

115 Burt & Perrett 1997; Luh, Rueckert & Levy 1991; Butler, Gilchrist, Burt *et al* 2005; Butler & Harvey 2005; Deglin 1976; Parente & Tommasi 2008.

116 Peuskens, Vanrie, Verfaillie *et al* 2005; Beauchamp, Lee, Haxby *et al* 2003.

117 Brancucci, Lucci, Mazzatenta *et al* 2009.

118 Facial expression: Suberi & McKeever 1977; Landis, Assal & Perret 1979; Ley & Bryden 1979; Etcoff 1984; Borod, Welkowitz, Alpert *et al* 1990; Habib 1986; Strauss & Moscovitch 1981; Narumoto, Okada, Sadato *et al* 2001; Blonder, Bowers & Heilman 1991. Body language: Borgomaneri, Gazzola & Avenanti 2015; Bolognini, Rossetti, Convento *et al* 2013

119 Gainotti, Barbier & Marra 2003; Giovanello, Alexander & Verfaellie 2003; Rakison & Poulin-Dubois 2001; Borgo & Shallice 2001; Caramazza & Shelton 1998; Mendez & Perryman 2002; Mendez & Lim 2004.

120 Yuvaraj, Yuvaraj, Murugappan *et al* 2013.

121 Sackeim, Gur & Saucy 1978; Nicholls, Wolfgang, Clode *et al* 2002; Blackburn & Schirillo 2012.

122 McGilchrist 2009b (257–9 & 305). See also Powell & Schirillo 2009; and Lindell 2013.

123 Grüsser 1983. Out of 103 mother and child sculptures dating from the period between 1900 BC and 0 BC, 99 showed the leftward cradling bias (Grüsser, Selke & Zynda 1988). As the left hemiface is usually larger than the right, in women the left breast is usually larger than the right (Loughry, Sheffer, Price *et al* 1989).

124 Salk 1973. Dagenbach, Harris & Fitzgerald (1988) give an overview of the literature, concluding that cradling bias is not a function of handedness.

- 125** Harris, Cárdenas, Spradlin *et al* 2009.
- 126** Manning & Chamberlain 1991.
- 127** Nachev, Roberts, Husain *et al* 2019.
- 128** Babinski 1914; Denny-Brown, Meyer & Horenstein 1952; Hécaen, de Ajuriaguerra & Massonet 1951.
- 129** Restak 1979 (195).
- 130** Baldo, Kacinik, Moncrief *et al* 2016.
- 131** Ornstein, Herron, Johnstone *et al* 1979: EEG activity over the right hemisphere predominates in reading stories and over the left hemisphere in reading a scientific textbook; and see Vitz 1990.
- 132** Hough 1990; Schneiderman, Murasugi & Saddy 1992; Moya, Benowitz, Levine *et al* 1986.
- 133** Myers 2005.
- 134** Brownell, Potter, Bihrlé *et al* 1986; Bryan 1988.
- 135** Tucker, Watson & Heilman 1977; Wechsler 1973; Brownell, Michel, Powelson *et al* 1983.
- 136** Shamay-Tsoory, Tomer & Aharon-Peretz 2005; Bohrn, Altmann & Jacobs 2012; Eviatar & Just 2006; Voyer, Bowes & Techentin 2008; Saban-Bezael & Mashal 2017; Champagne-Lavau, Cordonier, Bellmann *et al* 2018.
- 137** Bihrlé, Brownell, Powelson *et al* 1986; Coulson & Williams 2005; Coulson & Wu 2005; Shammi & Stuss 1999; Gardner, Ling, Flamm *et al* 1975; Goel & Dolan 2001; Dagge & Hartje 1985; Heath & Blonder 2005; Lehman Blake 2003; Marinkovic, Baldwin, Courtney *et al* 2011.
- 138** Winner, Brownell, Happé *et al* 1998.
- 139** Powers, Bencic, Horton *et al* 2012; Beeman 1998; Benowitz, Moya & Levine 1990; Hough 1990; Beeman & Chiarello 1998.
- 140** Wapner, Hamby & Gardner 1981.
- 141** Gardner, Brownell, Wapner *et al* 1983.
- 142** Beeman 1998; Benowitz, Moya & Levine 1990; Hough 1990; Beeman & Chiarello 1998; St George, Kutas, Martinez *et al* 1999.
- 143** Brownell, Simpson, Bihrlé *et al* 1990.
- 144** Bookheimer 2002.
- 145** Beeman 1998.
- 146** Poppelreuter 1917, vol 1 (329–30): » *Bei der Wiedergabe eines Kinofilms bringt [Spyra] eine große Anzahl von richtig beobachteten Einzelszenen ohne Erfassung der Handlungsgliederung* «.
- 147** McNeill 1992 (345–52); Schneiderman, Murasugi & Saddy 1992.
- 148** Wapner, Hamby & Gardner 1981.
- 149** *ibid* (24).
- 150** *ibid*, *loc cit*.
- 151** Myers 2005.
- 152** Benowitz, Finkelstein, Levine *et al* 1990 (330: emphasis added).
- 153** Velichkovsky, Krotkova, Sharaev *et al* 2017.
- 154** Gardner, Karnosh, McClure *et al* 1955 (500).
- 155** Mensh, Schwartz, Matarazzo *et al* 1952 (795).
- 156** Gardner, Karnosh, McClure *et al* 1955 (496–9).

- 157** Velichkovsky, Krotkova, Sharaev *et al* 2017.
- 158** *ibid*; and see Koelsch, Kasper, Sammler *et al* 2004.
- 159** Velichkovsky *et al*, *op cit*.
- 160** Bitan, Lifshitz, Breznitz *et al* 2010; Harasawa & Shioiri 2011; Stephan, Fink & Marshall 2007; Stephan, Penny, Marshall *et al* 2005; McIntosh & Gonzalez-Lima 1994.
- 161** Zaidel 1994 (167).
- 162** Sperry 1974a (16).
- 163** Hoppe 1977 (esp 234); Hoppe & Bogen 1977.
- 164** Dimond 1979c (204).
- 165** TenHouten, Hoppe, Bogen *et al* 1985.
- 166** Zaidel 1994 (170).
- 167** Dimond 1979c (203: emphasis added).
- 168** Kircher, Brammer, Tous Andreu *et al* 2001.
- 169** Mashal & Faust 2008.
- 170** Argyriou, Byfield & Kita 2015; Forgács, Lukács & Pléh 2014.
- 171** Passeri, Capotosto & Di Matteo 2015.
- 172** Sharp, Scott & Wise 2004.
- 173** Rissman, Eliassen & Blumstein 2003.
- 174** Xu, Kemeny, Park *et al* 2005.
- 175** Just, Carpenter, Keller *et al* 1996.
- 176** Cardillo, Watson, Schmidt *et al* 2012; Lai, van Dam, Conant *et al* 2015.
- 177** *ibid*.
- 178** Bell & Karnosh 1949.
- 179** Gardner & Denes 1973.
- 180** Brownell, Potter, Michelow *et al* 1984.
- 181** Zurif, Caramazza, Myerson *et al* 1974.
- 182** McGilchrist 2009b (70-5).
- 183** Eg, Foldi 1987; Bottini, Corcoran, Sterzi *et al* 1994.
- 184** Parts of this discussion of metaphor are adapted from McGilchrist (2018).
- 185** Bottini, Corcoran, Sterzi *et al* 1994; Eviatar & Just 2006; Mashal, Faust & Hendler 2005; Mashal, Faust, Hendler *et al* 2007.
- 186** Schmidt & Seger 2009.
- 187** Rapp, Leube, Erb *et al* 2004; Eviatar & Just 2006; Lee & Dapretto 2006; Stringaris, Medford, Giampietro *et al* 2007; Giora, Zaidel, Soroker *et al* 2000; Rinaldi, Marangolo & Baldassarri 2004.
- 188** Faust & Mashal 2007; Foldi, Cicone & Gardner 1983; Kaplan, Brownell, Jacobs *et al* 1990; Schmidt, DeBuse & Seger 2007; Mashal, Faust & Hendler 2005. There are some useful reflections on the relationship between poetry and the right hemisphere in Kane 2004. The distinction has been confirmed by a priming paradigm (Chettih, Durgin & Grodner 2012).
- 189** Schmidt, DeBuse & Seger 2007.

190 Mashal & Faust 2008. Every study that I am aware of in which there has been a failure to find right hemisphere recruitment during metaphor comprehension was *both* a scanning study *and* employed only familiar or conventional metaphors, which cannot be expected to recruit the right hemisphere (Rapp, Leube, Erb *et al* 2004; Rapp, Leube, Erb *et al* 2007; Lee & Dapretto 2006). Thus, according to the authors of one such paper, ‘the metaphors in our study were very simple statements, so-called predicate metaphors (eg, “the alarm clock is a torturer”)’ (Rapp, Leube, Erb *et al* 2004). Reference to ‘torture’ is an overused way of expressing displeasure – ‘it was torture having to drag myself out of bed this morning’. Another study was able to differentiate phrases such as ‘rainclouds are pregnant ghosts’ (appreciated by the right hemisphere) from ‘babies are angels’ (appreciated by the left) (Schmidt, DeBuse and Seger 2007). Bottini and colleagues (Bottini, Corcoran, Sterzi *et al* 1994), who found a right hemisphere pre-eminence, used phrases that still required the bringing together of two distinct ideas, eg, ‘the policeman who didn’t give straight answers was jumping ditches’. Lee & Dapretto, who found no such right hemisphere pre-eminence in metaphor, used single word sequences to exhibit the so-called ‘figurative’ meaning of, for example, the word ‘quick’ (‘slow – quick – fast’ versus ‘slow – quick – smart’), or ‘cold’ meaning unfriendly, examples which have little or no metaphoric status, lack the context in which they could be seen to be metaphorical, and are, in any case, routine, if not banal (Lee *et al*, *op cit*). The study of Stringaris and colleagues was similarly unlikely to test true metaphorical understanding; indeed, the paradigm ‘metaphor’ they report using – ‘some surgeons are butchers’ – is hardly a metaphor at all (Stringaris, Medford, Giampietro *et al* 2007). While such examples probably do involve some low-level RH processing, there is no ‘spike’ in use, because the brain does not register anything to be ‘worked out’ – it’s not experienced as different from saying ‘some surgeons are brutal (or insensitive, or clumsy)’.

191 Mashal, Faust, Hendler *et al* 2008.

192 Jung-Beeman 2005; Giora, Fein, Laadan *et al* 2007.

193 Bohr, Altmann & Jacobs 2012.

194 Rapp, Mutschler & Erb 2012.

195 Yang 2014.

196 Foldi, Ciccone & Gardner 1983; Kaplan, Brownell, Jacobs *et al* 1990.

197 Foldi *et al*, *op cit*; Mackenzie, Begg, Brady *et al* 1997; Mackenzie, Begg, Lees *et al* 1999; Rinaldi, Marangolo & Baldassarri 2004; Winner & Gardner 1977; Kempler, Van Lancker, Marchman *et al* 1999; Brownell, Potter, Bihle *et al* 1986; Brownell, Potter, Michelow *et al* 1984; Brownell, Simpson, Bihle *et al* 1990; Winner, Brownell, Happé *et al* 1998.

198 Anaki, Faust & Kravetz 1998a; Anaki, Faust & Kravetz 1998b; Faust & Weisper 2000; Faust & Mashal 2007; Schmidt, DeBuse & Seger 2007; Mashal, Faust, Hendler *et al* 2008.

199 Eg, Laurent, Denhières, Passerieux *et al* 2006: ‘the analyses yielded a larger N400, originating from the right but not the left superior/middle temporal gyrus, for the metaphorically related words relative to the non-related words’. See also Proverbio, Crotti, Zani *et al* 2009; Sotillo, Carretié, Hinojosa *et al* 2005; Pynte, Besson, Robichon *et al* 1996.

200 Tremblay, Monetta, Langlois *et al* 2016.

201 Pobric, Mashal, Faust *et al* 2008.

202 Mashal, Faust, Hendler *et al* 2008.

203 Mashal, Faust, Hendler *et al* 2007, 2008 & 2009; Schmidt, DeBuse & Seger 2007.

204 Diaz, Barrett & Hogstrom 2011; Bottini, Corcoran, Sterzi *et al* 1994; Pobric, Mashal, Faust *et al* 2008; Mashal & Faust 2005; Mashal, Faust & Hendler 2007; Mashal, Faust & Hendler 2008; Bambini, Gentili, Ricciardi *et al* 2011.

205 Prat, Mason & Just 2012.

- 206** Cardillo, Watson, Schmidt *et al* 2012.
- 207** Schmidt & Seger 2009.
- 208** Ahrens, Liu, Lee *et al* 2007; Bottini, Corcoran, Sterzi *et al* 1994; Mashal, Faust, Hendler *et al* 2007 & 2008; Lee & Dapretto 2006; Schmidt & Seger 2009; Stringaris, Medford, Giora *et al* 2006.
- 209** Citron & Goldberg 2014.
- 210** Pobric, Mashal, Faust *et al* 2008; Sotillo, Carretié, Hinojosa *et al* 2005.
- 211** Kirsner 1980.
- 212** Wager & Smith 2003.
- 213** Eg, Baron-Cohen, Ring, Moriarty *et al* 1994.
- 214** Eg, Shamay-Tsoory, Tomer, Berger *et al* 2003.
- 215** Baron-Cohen, Ring, Wheelwright *et al* 1999.
- 216** Lorberbaum, Newman, Horwitz *et al* 2002.
- 217** Di Martino, Ross, Uddin *et al* 2009.
- 218** *ibid.*
- 219** Jabbi, Kippenhan, Kohn *et al* 2012.
- 220** Gündel, López-Sala, Ceballos-Baumann *et al* 2004; Watkins, Paus, Lerch *et al* 2001. The size of the posterior cingulate cortex is broadly the same in either hemisphere.
- 221** Butti, Sherwood, Hakeem *et al* 2009.
- 222** Allman, Tetreault, Hakeem *et al* 2010 & 2011.
- 223** Shaw, Lalonde, Lepage *et al* 2009.
- 224** Brüne, Schöbel, Karau *et al* 2010.
- 225** Eg, Rothmayr, Baumann, Endestad *et al* 2007; Nagel, Herting, Maxwell *et al* 2013; van der Ham, van Strien, Oleksiak *et al* 2010; Wager & Smith 2003; van Dam, Decker, Durbin *et al* 2015.
- 226** Kinsbourne & Bemporad 1984.
- 227** Tabibnia, Monterosso, Baicy *et al* 2011.
- 228** Schultheiss, Riebel & Jones 2009 (emphasis in original).
- 229** Schultheiss & Brunstein 2002. Interestingly, inhibition in this sense does not mean repression: research shows that activity inhibition is often associated with *more*, not less, physiological activation (Fontana, Rosenberg, Marcus *et al* 1987) and expressive behaviour (Schultheiss & Brunstein 2002).
- 230** Damasio 1994.

7. COGNITIVE INTELLIGENCE

- 1 Fiore & Schooler 1998 (367).
- 2 Nowicka & Tacikowski 2011.
- 3 Medawar 1979 (25, n2).
- 4 Gottfredson 1997.
- 5 Ritchie 2015.
- 6 Barbey, Colom, Paul *et al* 2014; referring to Carroll 1993a; Cattell 1971.
- 7 Jensen 1998.
- 8 Barbey, Colom, Paul *et al* 2014 (emphasis added).
- 9 Gläscher, Rudrauf, Colom *et al* 2010.
- 10 O'Boyle & Benbow 1990; O'Boyle, Benbow & Alexander 1995; Gardner 1983; Troup, Bradshaw & Nettleton 1983.
- 11 O'Boyle, Benbow & Alexander 1995 (emphasis added).
- 12 Smith 1976.
- 13 Smith & Sugar 1975.
- 14 Korkman, Granström, Kantola-Sorsa *et al* 2005.
- 15 Pulsifer, Brandt, Salorio *et al* 2004.
- 16 Jensen 1998 (213); Deary 2000; Jensen 1987; Jensen 2006.
- 17 Jensen 2006; Jensen 2011.
- 18 Der & Deary 2017.
- 19 Woodley & Fernandes 2016; Woodley, te Nijenhuis & Murphy 2013.
- 20 Deary, Bell, Bell *et al* 2004; Meyer, Hagmann-von Arx, Lemola *et al* 2010.
- 21 Left hemisphere language areas have an effect on perception: it is important to make a distinction between tasks in which categorisation or naming is involved and those in which they are not (Barnett 2008). Prior to acquisition of linguistic labels, even colour categorisation is right hemisphere-dependent; after learning colour names, categorisation of colours (not perceptual discrimination) migrates to the left hemisphere (Franklin, Drivonikou, Bevis *et al* 2008; Franklin, Drivonikou, Clifford *et al* 2008). However, colour discrimination remains principally right hemisphere-dependent: Denes & Pizzamiglio 1999 (399); Eysenck 2000 (95); De Renzi & Spinnler 1967; Scotti & Spinnler 1970; Davidoff 1976; Hannay 1979; Pennal 1977; Sasaki, Morimoto, Nishio *et al* 2007; Brewer, Liu, Wade *et al* 2005; Howard, ffytche, Barnes *et al* 1998; Kosslyn, Thompson, Costantini-Ferrando *et al* 2000; Njemanze, Gomez & Horenstein 1992; Mendola, Rizzo, Cosgrove *et al* 1999; Clapp, Kirk, Hausmann 2007; Levy & Trevarthen 1981; Barnett 2008; Pirot, Pulton & Sutker 1977; Pallis 1955. One experimental study found no difference, however: Danilova & Mollon 2009.
- 22 De Renzi & Faglioni 1965; Benson & Barton 1970.
- 23 Boller, Howes & Patten 1970.
- 24 Howes & Boller 1975.
- 25 Prescott, Gavrilescu, Cunningham *et al* 2010; Benbow 1986; Benbow & Lubinski 1993; O'Boyle, Alexander & Benbow 1991; O'Boyle, Cunningham, Silk *et al* 2005.

- 26 Desco, Navas-Sanchez, Sanchez-González *et al* 2011.
- 27 Ford 2017.
- 28 Flynn 1984; Flynn 1987.
- 29 Trahan, Stuebing, Fletcher *et al* 2014; Pietschnig & Voracek 2015.
- 30 Flynn 2006.
- 31 Hawkes & Savage 2000.
- 32 Tymms & FitzGibbon 2001.
- 33 Shayer & Ginsburg 2007.
- 34 Report available at: www.act.org/content/dam/act/unsecured/documents/Readiness-Matters.pdf .
- 35 Report of the Pew Research Center, 2014, available at https://www.pewresearch.org/wp-content/uploads/2019/09/FT_19.09.25_NonBookReaders_Methodology_Topline.pdf; and www.pewresearch.org/fact-tank/2019/09/26/who-doesnt-read-books-in-america/.
- 36 Shayer 1999.
- 37 Shayer, Ginsburg & Coe 2007.
- 38 Shayer, Ginsburg & Coe 2007.
- 39 Flynn & Shayer 2018.
- 40 Dutton & Lynn 2013; Pietschnig & Voracek 2015.
- 41 Dutton, van der Linden & Lynn 2016.
- 42 Sundet, Barlaug & Torjussen 2004.
- 43 Teasdale & Owen 2008.
- 44 Kõgesaar 2013.
- 45 Shayer & Ginsburg 2007; Shayer & Ginsburg 2009.
- 46 Dutton & Lynn 2015.
- 47 Woodley & Meisenberg 2013.
- 48 Cotton, Kiely, Crewther *et al* 2005.
- 49 Flynn 2009.
- 50 Flynn 2006.
- 51 Flynn & Shayer 2018.
- 52 *ibid.*
- 53 *ibid.*
- 54 Colom, Lluís-Font & Andrés-Pueyo 2005; Carroll 1993b; Woodley & Figueredo 2013; Woodley, Fernandes, José Figueredo *et al* 2015.
- 55 See, eg, Plomin, DeFries, Knopik *et al* 2013; Jensen 1969; Gottfredson 1997; Polderman, Benyamin, de Leeuw *et al* 2015; Sniekers, Stringer, Watanabe *et al* 2017; Deary, Penke & Johnson 2010; Edmonds, Isaacs, Visscher *et al* 2008; Jacobs, van Os, Derom *et al* 2007; Johnson, Bouchard, McGue *et al* 2007.
- 56 te Nijenhuis, van Vianen & van der Flier 2007.
- 57 Rushton & Jensen 2010; Rushton 1999; te Nijenhuis, van Vianen & van der Flier 2007; Wicherts, Dolan, Hessen *et al* 2004.

- [58](#) Rushton 1999; Must, Must & Raudik 2003; te Nijenhuis & van der Flier 2007; te Nijenhuis & van der Flier 2013.
- [59](#) Woodley & Fernandes 2016.
- [60](#) Lynn 2011. See also Loehlin 1997.
- [61](#) Blair, Gamson, Thorne *et al* 2005.
- [62](#) Neisser 1997; Must & Must 2013; te Nijenhuis, De Jong, Evers *et al* 2004; Colom & Garcia-Lopez 2003; Wicherts, Dolan, Hessen *et al* 2004.
- [63](#) Jensen 1998; and see te Nijenhuis, van Vianen & van der Flier 2007.
- [64](#) Flynn 1987.
- [65](#) Sperry 1974a (12). Sperry's research led him to conclude 'that the scores for the Progressive Matrices Test do not in themselves eminently distinguish left and right hemispheric capabilities'.
- [66](#) Jensen 1998 (213); Deary 2000; Jensen 1987 & 2006.
- [67](#) Silverman 2010; Woodley, te Nijenhuis & Murphy 2014.
- [68](#) Woodley *et al*, *op cit*.
- [69](#) Woodley & Fernandes 2016.
- [70](#) Hallpike 1979.
- [71](#) Flynn 2006.
- [72](#) Bruell & Albee 1962.
- [73](#) Flynn 2006.
- [74](#) *ibid*.
- [75](#) Pietschnig, Voracek & Formann 2010.
- [76](#) Pietschnig & Gittler 2015.
- [77](#) Bratsberg & Rogeberg 2018.

8. CREATIVITY

1 Shelley 1921 (53). His essay, *A Defence of Poetry*, was written in 1821, though first published posthumously in 1840.

2 Lichtenberg 1967–72b (411), *Sudelbuch K*, §76: » Es denkt, *sollte man sagen, so wie man sagt*: es blitzt «. Lichtenberg is not just making the point that Descartes overstepped his own principles by assuming the existence of a thinking *subject* over and above the observable phenomenon of thinking. He is also offering an insight into the way thoughts come with an energy of their own – ‘in a flash’, as we say.

3 Ducatez, Sol, Sayol *et al* 2020; Sol 2003.

4 McDermott, Szpunar & Christ 2009; Roediger & McDermott 2013.

5 Martindale 1999.

6 Wallas 1926.

7 Lindell 2011.

8 Guilford 1967.

9 Cropley 2006.

10 As many readers will know, the answer is four; but demonstrating why that is the case is far from straightforward. It has been demonstrated by computer (Appel, Haken & Koch 1977), but this gives rise to a question about the nature of proof, since it is impossible for the proof to be surveyed by a human being within a lifetime, and the result is accepted on the basis that a ‘computer tells us so’ (see Tymoczko 1979).

11 Schopenhauer 2000, vol II (391): ‘Talent is like the marksman who hits a target which others cannot reach; genius is like the marksman who hits a target, as far as which others cannot even see’.

12 Asimov 2014.

13 Poincaré 1913c (386); cf 1914 (51). Poincaré’s *Science et Méthode* was translated into English almost simultaneously by Halsted (publ 1913) and Maitland (publ 1914). Each version has its strengths, and I have selected whichever seemed to me superior in any one case, but for the reader’s convenience I have always indicated where the corresponding passage may be found in the other text.

14 Steve Jobs, interviewed by Gary Wolf: www.wired.com/1996/02/jobs-2/.

15 Heraclitus fr IX [Diels 35, Marcovich 7] (trans C Kahn). Throughout this book, I use the notation of Charles Kahn’s *The Art and Thought of Heraclitus* (Cambridge University Press, 1979) but give both Diels’s and Marcovich’s numbers for reference.

16 Förster, Friedman & Liberman 2004.

17 This is broadly in line with Herbert Simon’s views on creativity (Simon 1983, 4569).

18 Asari, Konishi, Jimura *et al* 2008. See also McGilchrist 2009b (51ff *et passim*).

19 Barron & Harrington 1981; Rushton 1990.

20 Beaty & Silvia 2013.

21 See Chapter 7.

22 Jauk, Benedek, Dunst *et al* 2013. See also Park, Lubinski & Benbow 2007; Park, Lubinski & Benbow 2008; Wai, Lubinski & Benbow 2005; and Jaušovec 2000.

- [23](#) Zedelius & Schooler 2016; Flowers & Garbin 1989; Baird, Smallwood, Mrazek 2012.
- [24](#) Kasof 1997.
- [25](#) James 1890, vol 1 (244).
- [26](#) Asimov 2014 (emphasis added).
- [27](#) Knoblich, Ohlsson, Haider *et al* 1999.
- [28](#) Zander, Öllinger & Volz 2016.
- [29](#) Gaut 2010.
- [30](#) Steiner 1978b (34).
- [31](#) Ghiselin 1985 (14).
- [32](#) Poincaré 1914 (130); cf 1913c (438).
- [33](#) Magee 2002.
- [34](#) Schopenhauer 2000, vol I (50).
- [35](#) Poincaré 1914 (129–30: emphasis added); cf 1913c (438).
- [36](#) Newman 1998 (261–2), ‘Sermon 13: Implicit and explicit reason’.
- [37](#) Davis & Hersh 1990 (3).
- [38](#) Baillet 1691 (Bk 2, ch 1, 81): « *Il nous apprend que le dixième de novembre mil six cent dix-neuf, s'étant couché tout rempli de son enthousiasme et tout occupé de la pensée d'avoir trouvé ce jour-là les fondements de la science admirable, il eut trois songes consécutifs en une seule nuit, qu'il s'imagina ne pouvoir être venus que d'en haut.* »
- [39](#) Waismann 1968 (37).
- [40](#) Langer 1953 (105: emphasis added).
- [41](#) Eckermann 1970 (415; entry for 20 June 1831).
- [42](#) Poincaré 1913c (390); cf 1914 (57).
- [43](#) Medawar 1979 (84: emphasis added).
- [44](#) Lorenz 1971, vol 2 (xxi–xxiii: emphasis in original). In similar vein, see Polányi 1966 (78–9; emphases in original): ‘Science is supposed to be dispassionate. There is indeed an idealisation of this current today, which deems the scientist not only indifferent to the outcome of his surmises, but actually seeking their refutation. This is not only contrary to experience, but logically inconceivable. The surmises of a working scientist are *born of the imagination seeking discovery*. Such effort *risks* defeat but never *seeks* it; it is in fact his craving for success that makes the scientist take the risk of failure. There is no other way.’
- [45](#) Wertheimer 1959 (228).
- [46](#) Klein & Jarosz 2011.
- [47](#) Ramachandran 1994.
- [48](#) See, eg, Hutsler & Galuske 2003.
- [49](#) See, eg, Jacob, Schall & Scheibel 1993; Scheibel, Fried, Paul *et al* 1985; Seldon 1981.
- [50](#) Kounios & Beeman 2014.
- [51](#) For a review, see Holland & Kensinger 2010. Also: Buchanan, Tranel & Adolphs 2006; Brewin, Dalgleish & Joseph 1996; Conway & Pleydell-Pearce 2000; Ross, Homan & Buck 1994.
- [52](#) See McGilchrist 2009b (57–70). Also: Panksepp 1998; Liotti & Tucker 1992 & 1994; Ross, Homan & Buck 1994.

53 See Roberts, Beer, Werner *et al* 2004; Sullivan & Gratton 2002; Levy, Heller, Banich *et al* 1983a; Heilman, Schwartz & Watson 1978; Heilman & van den Abell 1979; Lane, Novelly, Cornell *et al* 1988; Wittling & Pflüger 1990.

54 Tsujii, Masuda, Akiyama *et al* 2010. Also McGilchrist 2009b (193).

55 Sternberg & Davidson 1996 (67 & 130–52).

56 Friedlander & Fine 2016. In this study only proxies for intelligence were measured: the study sample was found to have levels of graduate and post-graduate attainment 8–10 times higher than the UK average for the relevant time-period, and to have pursued ‘cognitively complex post-university careers’, principally in STEM subjects.

57 Fiore & Schooler 1998.

58 Bowden & Jung-Beeman 2003.

59 Kleinschmidt, Buchel, Hutton *et al* 2002; Ploran, Nelson, Velanova *et al* 2007.

60 Aziz-Zadeh, Kaplan & Iacoboni M 2009.

61 Nelson, Dosenbach, Cohen *et al* 2010.

62 Jung-Beeman, Bowden, Haberman *et al* 2004.

63 *ibid.* See also Parsons & Osherson 2001; Bowden & Jung-Beeman 2003; Kounios, Fleck, Green *et al* 2008; Sandkühler & Bhattacharya 2008. For a more detailed examination of the evidence, see Appendix 1.

64 Kounios & Beeman 2014.

65 Subramaniam, Kounios, Parrish *et al* 2009.

66 Jung-Beeman, Bowden, Haberman *et al* 2004.

67 Kounios & Beeman 2014: ‘It appears likely that the pre-insight alpha burst reflects transient sensory gating that reduces noise from distracting inputs to facilitate retrieval of the weakly and unconsciously activated solution represented in the right temporal lobe ... This idea is analogous to the common behavior of closing or averting one’s eyes to avoid distractions that would otherwise interfere with intense mental effort.’

68 *ibid.*

69 Zhao, Zhou, Xu *et al* 2014.

70 Beeman & Bowden 2000.

71 Bowden & Jung-Beeman 2003.

72 Dehaene, Spelke, Pinel *et al* 1999; Goel, Buchel, Frith *et al* 2000.

73 Mihov, Denzler & Förster 2010.

74 Friedman & Förster 2000, 2001, 2002 & 2005: yet further evidence against Richard Davidson’s ‘LH approach/RH avoidance’ model.

75 Mihov, Denzler & Förster 2010.

76 *ibid.*

77 Bowden, Jung-Beeman, Fleck *et al* 2005; Fiore & Schooler 1998; Jung-Beeman, Bowden, Haberman *et al* 2004; Mashal, Faust, Hendler *et al* 2007. See also Abdullaev & Posner 1997.

78 Winner 2000; Leonhard & Brugger 1998; Mendez 2004; Weinstein & Graves 2002; Fiore & Schooler 1998; Katz 1983 & 1985; Rubenzer 1979.

79 Reverberi, Toraldo, D’Agostini *et al* 2005.

80 Shamay-Tsoory, Adler, Aharon-Peretz *et al* 2011.

- 81** Huang, Qiu, Shen *et al* 2013.
- 82** Miller, Boone, Cummings *et al* 2000; and Miller, Cummings, Mishkin *et al* 1998.
- 83** Mendez 2004.
- 84** Ramachandran 1995. See also Smith, Tays, Dixon *et al* 2002; and Smith, Dixon, Tays *et al* 2004.
- 85** Miller & Tippet 1996; see also Goel 1995.
- 86** Sandson & Albert 1987.
- 87** Danckert, Stöttinger, Quehl *et al* 2012.
- 88** Burgess, Veitch, de Lacy Costello *et al* 2000. See also Burgess 2000.
- 89** Goel & Grafman 2000.
- 90** See McGilchrist 2009b (84–6).
- 91** This is a matter I explored at some length in *The Master and his Emissary* (Chapter 12). A subsequent paper makes a similar point (Rode, Vallar, Chabanat *et al* 2018).
- 92** Pachalska, Grochmal-Bach, Wilk *et al* 2008.
- 93** Schnider, Regard, Benson *et al* 1993.
- 94** Blanke & Pasqualini 2012.
- 95** Kuhn 1925; Schröder 1992.
- 96** Mazzucchi, Sinforiani & Boller 2013.
- 97** Troiani & Campbell 2015.
- 98** Blanke & Pasqualini 2012.
- 99** Nowell-Smith 2003: as quoted by Blanke *et al*, *op cit*.
- 100** Herzog 1991: as quoted by Bänzner & Hennerici 2007.
- 101** Jung 1974 (67): » *Obwohl die Regungslosigkeit der früherer Bilder vermieden wird, ist dies kein krankheitsbedingter Stilwandel, da ähnliche Darstellungen schon einige Jahre vor dem Schlaganfall beginnen.* «
- 102** Mazzucchi, Sinforiani & Boller 2013.
- 103** Bänzner & Hennerici 2007.
- 104** *ibid*.
- 105** Reinvang 1987. However, he had what is called crossed aphasia: ‘the results are interpreted as indicating a complete reversal of the normal pattern of lateralized cerebral representation of function’, and so not much can be deduced from it.
- 106** Vigouroux, Bonnefoi & Khalil 1990.
- 107** See, eg, Miller, Boone, Cummings *et al* 2000; Mell, Howard & Miller 2003; Tanabe, Nakagawa, Ikeda *et al* 1996.
- 108** Alajouanine 1948 (235–6); see also, for a modern commentary, Compston 2008. Boller and colleagues revisited Gernez’s *œuvre*, and while agreeing that his stroke had not impaired his ability to produce works of art, felt that he showed a tendency to produce more concrete and realistic paintings. However, they stress that they were not able to see all his work and that it is ‘practically impossible’ to attribute any such change to his stroke rather than to age (Boller, Sinforiani & Mazzucchi 2005).
- 109** Fraguas 2005.
- 110** Mancing 2004, vol 2 (751).
- 111** Pennell 1889 (23); see also *loc cit* 25.

112 Sherwood 2012.

113 Waldman 2000.

114 Zaimov, Kitov & Kolev 1969.

115 Gupta & Katsarska 2010.

116 Colombo & Assal 2007.

117 Elkins & Valiavicharska 2010 (233).

118 ‘Златю Бояджиев бил работохолик, не обичал парите’, *Sega Magazine*, 5 July 2003, retrievable at <https://old.segabg.com/article.php?id=94871>.

This article is wrongly cited by Wikipedia as the source for its own statement that his ‘style changed radically in the direction of grotesque imagery, the inclusion of dozens of shapes in compositions and expressive colour’. It says no such thing. Indeed his portraits done after the stroke are extraordinary for their lively, warm, evocation of the sitter.

119 Mazzucchi, Sinforiani & Boller 2013.

120 *ibid.*

121 Blanke 2007.

122 Colombo & Assal 2007.

123 Annoni, Devuyt, Carota *et al* 2005.

124 See, eg, Nadal, Schiavi & Cattaneo 2018; and Lengger, Fischmeister, Leder *et al* 2007.

125 Drago, Foster, Trifiletti *et al* 2006.

126 Heilman & Acosta 2013.

127 Schott 2012.

128 Takahata, Saito, Muramatsu *et al* 2014.

129 Nutt 2011.

130 Finkelstein, Vardi & Hod 1991.

131 Seeley, Matthews, Crawford *et al* 2008.

132 Taylor 2009 (97ff); and personal communication.

133 Midorikawa & Kawamura 2015.

134 Mazzucchi *et al*, *op cit.*

135 Zaidel 2017.

136 Zaidel 2013; Zaidel 2015.

137 Zaimov, Kitov & Kolev 1969 (the case of Zlatio Boiyadjiev referred to above); Boller, Sinforiani, Mazzucchi 2005 (also referred to above).

138 Jung 1974. Zaidel’s reference here is taken from – or alternatively is the origin of – a number of places in the literature where it has been faithfully copied by a succession of scholars who would presumably have learnt little from it, had they looked at it, since in the faithfully copied version its title is not so much German as gibberish.

139 Bätzner & Hennerici 2007.

140 Zaidel 2013.

141 Lindell 2011.

142 Mihov, Denzler & Förster 2010.

143 Kokoschka 1974 (94). Oddly, the same passage, quoted by Frank Whitford in his biography of Dix (1984), has ‘in my hand, the one that was not paralysed ...’ without mentioning the side, though in the original German autobiography it is clear: » *ich fühlte in der Hand, in meiner rechten, die nicht gelähmt war, meinen Revolver...* « (Kokoschka 1971, 156).

144 See Zagvazdin 2015 for a review.

145 Matthews 2013 (150).

146 Hutcheon & Hutcheon 2014 (1), referring to Evans 1996 (348); Kennedy 1993 (249 & 266).

147 Matthews 1978.

148 Labounsky 2000 (318).

149 O’Neill, Macsweeney, Cornell *et al* 2014.

150 Walsh 2006 (374).

151 Luria, Tsvetkova & Futer 1965.

152 Weiss 2013.

153 Lazzarini 2012, quoted in Zagvazdin 2015.

154 Zagvazdin *op cit*.

155 Breitenfeld, Solter, Breitenfeld *et al* 2006; Burrows 1994 (395).

156 Jacome 1984.

157 Sacks 2007 (157).

158 Zagvazdin 2015.

159 Judd T 1988a.

160 Judd T 1988b.

161 Gardner 1982.

162 Cytovic 1976.

163 Zaidel 2015.

164 Iniesta 2013.

165 Wu, Miller, Adhimoolam *et al* 2015.

166 Chi, Fregni & Snyder 2010.

167 Snyder, Mulcahy, Taylor *et al* 2003.

168 Luft, Zioga, Banissy *et al* 2017.

169 Metuki, Sela & Lavidor 2012.

170 Chrysikou, Hamilton, Coslett *et al* 2013.

171 Milano, Goldman, Woods *et al* 2016: ‘The decrease in visuo-spatial originality following left hemisphere stimulation provides support for the hypothesis that dysfunction of the left hemisphere may lead to increased creativity, as seen in semantic dementia, potentially through disinhibition of the right hemisphere.’

172 Hertenstein, Waibel, Frase *et al* 2019.

173 Dubischar-Krivec, Bölte, Braun *et al* 2014.

174 Treffert 2014.

175 Hughes 2012.

176 Pesenti, Zago, Crivello *et al* 2001.

- 177** Brink 1980.
- 178** Cerruti & Schlaug 2009; Metuki, Sela & Lavidor 2012; Zmigrod, Colzato & Hommel 2015.
- 179** Mayseless & Shamay-Tsoory 2015.
- 180** Chi & Snyder 2011 & 2012.
- 181** For a discussion of the methodology, see, eg, Been, Ngo, Miller *et al* 2007.
- 182** Goldberg, Podell & Lovell 1994; Ferrè, Arthur & Haggard 2013.
- 183** Drago, Foster, Okun *et al* 2009a. See also Palminteri, Serra, Buot *et al* 2013.
- 184** Drago, Foster, Okun *et al* 2009b.
- 185** Bhattacharya & Petsche 2005; Bhattacharya & Petsche 2002.
- 186** Kowatari, Lee, Yamamura *et al* 2009.
- 187** Brown, Martinez & Parsons 2006.
- 188** Hassler, Nieschlag & de la Motte 1990.
- 189** Benedek, Beaty, Jauk *et al* 2014.
- 190** Jung-Beeman 2005.
- 191** Kounios, Fleck, Green *et al* 2008; Kounios & Beeman 2014. See also Furst 1976. Furthermore, dichotic listening tasks reveal a strong association between better right hemisphere (left ear) localisation ability and creativity (Weinstein & Graves 2002). However, Martindale and colleagues, although they found right hemisphere dominance during creative thinking in creative individuals, did not find the pattern at rest in the same individuals (Martindale, Hines, Mitchell *et al* 1984).
- 192** Kounios & Beeman 2014 (emphasis added).
- 193** Saggar, Quintin, Kienitz *et al* 2015.
- 194** Klein & Jarosz 2011; Klein 2011.
- 195** Chrysikou, Weber & Thompson-Schill 2014.
- 196** Usher, Russo, Weyers *et al* 2011.
- 197** Kounios, Fleck, Green *et al* 2008.
- 198** Fink, Graif & Neubauer 2009; Fink, Grabner, Benedek *et al* 2009; Fink & Neubauer 2008; Grabner, Fink & Neubauer 2007.
- 199** Benedek, Bergner, Könen *et al* 2011.
- 200** Benedek, Schickel, Jauk *et al* 2014.
- 201** Yoruk & Runco 2014 (8): ‘High IQ individuals, however, displayed greater decoupling of brain areas than average IQ individuals. During DT [divergent thinking] problems highly creative individuals showed more co-operation in the lower alpha wave. In the upper alpha wave, however, highly creative individuals displayed more decoupling of brain areas. In the upper alpha wave, again, high IQ individuals showed more co-operation between brain regions in the right hemisphere during DT tasks. High IQ individuals displayed more decoupling of brain regions in the lower alpha wave during DT task’.
- 202** Sheth, Sandkühler & Bhattacharya 2009.
- 203** Lindell 2011.
- 204** Aberg, Doell & Schwartz 2017.
- 205** Elliott & Dolan 1998; Goel & Dolan 2000.
- 206** Bengtsson, Csíkszentmihályi & Ullén 2007.

- 207** Shah, Erhard, Ortheil *et al* 2013.
- 208** Solso 2001.
- 209** Kowatari, Lee, Yamamura *et al* 2009.
- 210** CR Aldous 2007.
- 211** Jaušovec 2000; Jaušovec & Jaušovec 2000a; Moore, Bhadelia, Billings *et al* 2009.
- 212** Moore *et al*, *op cit*.
- 213** Bogen & Bogen 1988; Kowatari, Lee, Yamamura *et al* 2009.
- 214** Bogen *et al*, *op cit*; Brown & Paul 2000.
- 215** Mihov, Denzler & Förster 2010.
- 216** Percy 1990 (5).
- 217** Shlain 2014 (7).
- 218** Waismann 1968 (37).
- 219** Dietrich & Kanso 2010.
- 220** Answer: they all make compound words with FRUIT.
- 221** Dietrich 2007.
- 222** Dyson 2012.
- 223** Bronowski 1958 (63).
- 224** Lockhart 2009 (31).
- 225** *ibid* (37).
- 226** www.definingcreativity.com/thomas-edison/ – from the blog of Wouter Boon, author of *Defining Creativity: The Art and Science of Great Ideas*, BIS, 2014 (emphasis added).
- 227** Dietrich 2015 (148).
- 228** Wolff 1994 (395).
- 229** *ibid*.
- 230** *ibid* (393).
- 231** The ‘Capriccio on the departure of a beloved brother’ in B-flat major, BWV 992, described by the composer Hubert Parry as ‘the most dexterous piece of work of the kind that had ever appeared in the world up to that time’. And yet it is also quite different from anything else Bach wrote subsequently. Fully to appreciate its beauty, I recommend the live recording made by Tatiana Nikolayeva in 1982: www.youtube.com/watch?v=E227g8sv1SE.
- 232** The authenticity of this text has been much doubted and is considered by some to be a forgery. It was first mentioned in the *Allgemeine Musikalische Zeitung*, 24, for 23 August 1815, but was made better known by its inclusion in the appendix to Otto Jahn’s biography (1858, vol iii, suppl 21, 498–9). Jahn himself believed that, while it could not be Mozart’s *ipsissima verba*, it was probably based on a letter of Mozart’s which had been revised and embellished by the musicologist Rochlitz. Its contents are nonetheless in accord with so many asides in letters to his father and others about his composing process that it could be thought of as a compendium or distillation of his experience. The text here translated reads in German: » *Wie nämlich meine Art ist beym Schreiben und Ausarbeiten von großen und derben Sachen nämlich? – Ich kann darüber wahrlich nicht mehr sagen als das; denn ich weiß selbst nicht mehr, und kann auf weiter nichts kommen. Wenn ich recht für mich bin und guter Dinge, etwa auf Reisen im Wagen, oder nach guter Mahlzeit beym Spazieren, und in der Nacht, wenn ich nicht schlafen kann, da kommen mir die Gedanken stromweis und am besten. Woher und wie, das weiß ich nicht, kann auch nichts dazu. Die mir nun gefallen, die behalte ich im Kopf und*

summe sie wol auch vor mich hin, wie mir Andere wenigstens gesagt haben. Halt' ich das nun fest, so kömmt mir bald Eins nach dem Andern bey, wozu so ein Brocken zu brauchen wäre, um eine Pastete daraus zu machen, nach Contrapunkt, nach Klang der verschiedenen Instrumente etc. etc. etc. Das erhitzt mir nun die Seele, wenn ich nämlich nicht gestört werde; da wird es immer größer; und ich breite es immer weiter und heller aus; und das Ding wird im Kopf wahrlich fast fertig, wenn es auch lang ist, so daß ich's hernach mit Einem Blick, gleichsam wie ein schönes Bild oder einen hübschen Menschen, im Geist übersehe, und es auch gar nicht nacheinander wie es hernach kommen muß, in der Einbildung höre, sondern wie gleich alles zusammen. ... Wenn ich nun hernach einmal zum Schreiben komme, so nehme ich aus dem Sack meines Gehirns, was vorher, wie gesagt, hinein gesammelt ist. Darum kömmt es hernach auch ziemlich schnell aufs Papier; denn es ist, wie gesagt, eigentlich schon fertig und wird auch selten viel anders, als es vorher im Kopf gewesen ist. Darum kann ich mich auch bey dem Schreiben stören lassen; und mag um mich herum mancherley vorgehen: ich schreibe doch; kann auch dabey plaudern, nämlich von Hühnern und Gänsen, oder von Gretel und Bärbel u. dgl. Wie nun aber über dem Arbeiten meine Sachen überhaupt eben die Gestalt oder Manier annehmen, daß sie mozartisch sind, und nicht in der Manier irgend eines Andern: das wird halt eben so zugehen, wie, daß meine Nase eben so groß und herausgebogen, daß sie mozartisch und nicht wie bey andern Leuten geworden ist! Denn ich lege es nicht auf Besonderheit an, wüßte die meine auch nicht einmal näher zu beschreiben; es ist ja aber wol blos natürlich, daß die Leute, die wirklich ein Aussehen haben, auch verschieden von einander aussehen, wie von aussen, so von innen. Wenigstens weiß ich, daß ich mir das Eine so wenig, als das Andere gegeben habe. «

233 *The Harvard Magazine*, December 1862 (141).

234 Townsend 1852 (93).

235 See McGilchrist 2009b (310ff).

236 William Byrd 1605/1989 (xxxvi).

237 According to the memoirs of Picasso by the artist and writer 'Brassaï' (real name Gyula Halász), when asked whether his ideas came to him 'by chance or by design', Picasso replied: 'I don't have a clue. Ideas are simply starting points. I can rarely set them down as they come to my mind. As soon as I start to work, others well up in my pen. To know what you're going to draw, you have to begin drawing ... When I find myself facing a blank page, that's always going through my head. What I capture in spite of myself interests me more than my own ideas ... Matisse does a drawing, then he recopies it. He recopies it five times, ten times, each time with cleaner lines. He is persuaded that the last one, the most spare, is the best, the purest, the definitive one; and yet, usually it's the first. When it comes to drawing, nothing is better than the first sketch' (Brassaï 1999, 66). Another record of Picasso on his own creative process suggests, as does the above, something very far from the assembly line model beloved of Dietrich: 'A picture comes to me from far off, who knows how far, I divined it, I saw it, I made it, and yet next day I myself don't see what I have done. How can one penetrate my dreams, my instincts, which have taken a long time to elaborate themselves and bring themselves to the light, above all seize in them what I brought about, perhaps, against my will?' (Zervos 1935; trans B Ghiselin, in Ghiselin 1985, 52).

238 Ghiselin *op cit* (5).

239 Hadamard 1945.

240 von Weizsäcker 1972 (35).

241 Hennin 2010 (emphasis in original).

242 Poincaré 1914 (58); cf 1913c (391).

243 Dietrich 2015 (26–7).

244 In severe depression many patients report no feelings at all, and in such cases even seeing it as a mood disorder at all presents philosophical problems.

- 245** Eg, Dietrich 2015 (148).
- 246** Aristotle, *De arte poetica*, XXII.10, §1459a6–8 (trans WD Ross).
- 247** Aristotle, *Nicomachean Ethics* I.3, §1094b2–4 (trans WD Ross).
- 248** Selz 1991 (13); & Hughes 1991 (281). Munch lost his mother aged five and his elder sister, aged 13; he suffered from chronic anxiety with paranoid psychotic episodes, almost certainly exacerbated by alcoholism.
- 249** Aristotle, ‘Problems connected with thought, intelligence, and wisdom’, in *Problems II*, xxx (trans WS Hett).
- 250** See McGilchrist 2009b (62–4); also Wheeler, Davidson & Tomarken 1993. The brain correlates of mood are complex: they can vary markedly, definitely depend on a balance between anterior and posterior (dys)function (Tucker, Stenslie, Roth *et al* 1981) and may differ by sex and handedness (Bartolic, Basso, Schefft *et al* 1999), as well as being sensitive to context. Nonetheless overall a connexion between the right hemisphere and sadness or melancholy and the left hemisphere and euphoria appears to be robust.
- 251** Stewart, Bismark, Towers *et al* 2010; Thibodeau, Jorgensen & Kim 2006; Allen, Coan & Nazarian 2004.
- 252** Schmidt & Hanslmayr 2009.
- 253** Davidson, Taylor & Saron 1979; Furst 1976; Glass & Butler 1977.
- 254** Ruff, Allen, Farrow *et al* 1994; Benton 1968; Phelps, Hyder, Blamire *et al* 1997; Lee, Strauss, Loring *et al* 1997.
- 255** Davidson, Taylor & Saron 1979; Ahern & Schwartz 1985.
- 256** See McGilchrist 2009b, esp Chapter 9.
- 257** Cf also ‘Melancholia’ as portrayed by Henry Peacham in his *Minerva Britannia*, 1612 (126).
- 258** Lombroso 1891; Galton 1892; Lange-Eichbaum & Paul 1931; and Juda 1949.
- 259** Ellis 1904.
- 260** Post 1994.
- 261** Jarosz, Colflesh & Wiley 2012.
- 262** Hankir 2011.
- 263** Pucarín-Cvetković, Zuskin, Mustajbegović *et al* 2011.
- 264** Jamison 1993.
- 265** DeLong & Aldershof 1983; Richards, Kinney, Lunde *et al* 1988.
- 266** Janka 2004.
- 267** Andreasen 1987.
- 268** Andreasen 2008.
- 269** Jamison 1989.
- 270** *ibid* (131).
- 271** *ibid* (127).
- 272** Kaufman 2001.
- 273** Kaufman 2005.
- 274** Ludwig 1992.
- 275** Ludwig 1994.

- 276** See Andreasen 2005.
- 277** Kyaga, Landén, Boman *et al* 2013.
- 278** Office for National Statistics:
www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/suicidesintheunitedkingdom/2016registration#great-britain.
- 279** https://en.wikipedia.org/wiki/Category:Poets_who_committed_suicide.
- 280** Friday, 17 April 1778.
- 281** Zeman, Milton, Smith *et al* 2013. For reasons that, one can only surmise, may relate to different hemisphere specialisation in Far Eastern subjects, the reading of Chinese poetry compared with prose activates areas mainly in the *left* hemisphere (Gao & Guo 2018).
- 282** Kuck, Grossbach, Bangert *et al* 2003.
- 283** Ando, Claridge & Clark 2014. See also McBride 2004.
- 284** Schou 1979.
- 285** Andreasen 2008.
- 286** *ibid*.
- 287** Wintersgill 1994.
- 288** Borowiecki 2016.
- 289** See, eg, Nettle 2002.
- 290** Folley & Park 2005 (272).
- 291** Kyaga, Landén, Boman *et al* 2013. For schizophrenia, see, eg, Karlsson 1970; Kinney, Richards, Lowing *et al* 2001. For bipolar disorder, see, eg, Simeonova, Chang, Strong *et al* 2005; Richards, Kinney, Lunde *et al* 1988.
- 292** Richards *et al*, *op cit*.
- 293** Kyaga, Lichtenstein, Boman *et al* 2011.
- 294** MacCabe, Sariaslan, Almqvist *et al* 2018.
- 295** Power, Steinberg, Bjornsdottir *et al* 2015.
- 296** Davidson, Ekman, Saron *et al* 1990; Davidson, Schwartz, Saron *et al* 1979; Henriques & Davidson 1991; Schaffer, Davidson & Saron 1983; Tomarken, Davidson, Wheeler *et al* 1992.
- 297** Davidson *et al* 1990 *op cit*; Henriques *et al*, *op cit*.
- 298** Abele-Brehm 1992; Jaušovec 1989; Kaufmann & Vosburg 1997.
- 299** Tucker, Stenslie, Roth *et al* 1981.
- 300** Akinola & Mendes 2008.
- 301** *ibid*; Carlsson 2002; Kaufmann & Vosburg 1997; Madjar & Oldham 2002; Kaufman & Baer 2002; Verhaeghen, Joorman & Khan 2005.
- 302** See, eg, Isen, Daubman & Nowicki 1987; Hirt, Levine, McDonald *et al* 1997.
- 303** Bartolic, Basso, Schefft *et al* 1999.
- 304** Grawitch, Munz & Kramer 2003.
- 305** Hirt, Melton, McDonald *et al* 1996.
- 306** Harmon-Jones, Gable & Price 2013.
- 307** Disgust: Calder, Keane, Manes *et al* 2000; Bisiach 1997.

- 308** Fong 2006.
- 309** Holm-Hadulla, Roussel & Hofmann 2010.
- 310** Simonton 2014b.
- 311** Gorynia & Müller 2006; O’Boyle & Benbow 1990.
- 312** Ko & Kim 2008.
- 313** MacCabe, Lambe, Cnattingius *et al* 2010.
- 314** Smith, Anderson, Zammit *et al* 2015.
- 315** Gale, Batty, McIntosh *et al* 2013.
- 316** Zammit, Allebeck, David *et al* 2004.
- 317** The DSM, or Diagnostic and Statistical Manual of Mental Disorders, to give it its full title, is the reference point for standardising psychiatric diagnoses in the US. Its equivalent in Europe and the rest of the world is the ICD (International Classification of Diseases).
- 318** Weismann-Arcache & Tordjman 2012. On childhood depression rates in general, see Costello, Erkanli & Angold 2006.
- 319** Neihart 1999. See also Mash & Barkley 1996.
- 320** www.greatpotentialpress.com/wp-content/uploads/2012/03/Dabrowskis-Theory-and-Existential-Depression-Feb-09.pdf.
- 321** Wraw, Deary, Der *et al* 2016.
- 322** Davis, DellaGioia, Matuskey *et al* 2017.
- 323** The interested reader is referred to Simonton’s chapter on the question: Simonton 2014a.

9. WHAT SCHIZOPHRENIA AND AUTISM CAN TELL US

1 Bergson 1920 (47).

2 Carel 2013 (345: emphasis in original).

3 James 1902 (22).

4 For this reason, it is impossible to understand mental illness from ‘outside’, as if inspecting a machine that has a malfunctioning part. An ill person *must be understood from within*, as embodying a whole new way of being in the world. Thus the great psychiatrist Eugène Minkowski speaks of ‘the need to enter, with one leap, into the soul of the other’ – « *le besoin de pénétrer, en un seul acte, toute son âme* » (Minkowski 1997, 99–100). He contrasts what he calls inductive and intuitive understanding, and remarks that ‘the latter is in no way less important in life than the former: we very often call on it, and many times it constitutes the supreme criterion, far superior to all others’ – « *ce dernier mode de connaissance n’est nullement moins important dans la vie que le premier: nous y faisons appel bien souvent, et bien des fois il constitue le critère suprême, de beaucoup supérieur à tous les autres* » (*ibid*, 100).

5 This is true of all mental illnesses, but not in the same degree. It is pervasive in what are called the major mental illnesses: severe depression, bipolar disorder and schizophrenia. In some illnesses, such as obsessive-compulsive disorder and generalised anxiety disorder, for example, the degree to which reality is altered is not usually as pervasive – though sometimes it may be. And in some illnesses the problem is fairly well encapsulated, as psychiatrists say: it confines its expression to defined areas of experience, leaving much of the rest of life more or less unaltered.

6 Carroll & Owen 2009; Burbach & van der Zwaag 2009; Sullivan, Magnusson, Reichenberg *et al* 2012.

7 Autism is, in my view, not a unitary condition. In keeping with this, I believe, on the one hand, that the variety of presentations of autism is so great that we should talk about autisms, rather than autism; and it is well recognised that schizophrenia, too, takes many different forms. Added to which, there are conditions such as schizotypy and schizoid personality which are distinguishable from one another and from schizophrenia, though still forming part of what psychiatrists call the schizoid autistic, or schizo-autistic, spectrum. On the other hand, these conditions are grouped together precisely because of their having a large number of common characteristics: and it is with these that we will be concerned.

8 Sustained attention in autism: Chien, Gau, Shang *et al* 2015; Garretson, Fein & Waterhouse 1990; Vivanti, Fanning, Hocking *et al* 2017; sustained attention in schizophrenia: Nuechterlein & Dawson 1984; Asarnow & MacCrimmon 1981; sustained attention in modernity: Lorenz-Spreen, Mønsted, Hövel *et al* 2019. Face reading in schizophrenia; Kohler, Walker, Martin *et al* 2010; face reading in schizophrenia and autism: Ciaramidaro, Bölte, Schlitt *et al* 2018: ‘our findings are consistent with a common neural deficit during implicit negative facial affect recognition in schizophrenia and autism spectrum disorders’; face reading in autism: Gross 2004; Schultz 2005; face reading in modernity: Uhls, Michikyan, Morris *et al* 2014. Empathy in schizophrenia: Bora, Gökçen & Veznedaroglu 2008; Bonfils, Lysaker, Minor *et al* 2016; empathy in autism: Harmsen 2019; empathy in modernity: Konrath, O’Brien & Hsing 2011.

9 Indeed, as Claude Braun and Sabrina Suffren have argued in examining subjects with unilateral brain lesions, it may well be the unbridled cognitive propensities of the left hemisphere, specifically jumping to conclusions and excessive reference to the self, which are the primary factors in delusional thinking – the situation merely being compounded by, not necessarily grounded in, the

perceptual or cognitive deficits that accompany right hemisphere dysfunction: ‘left hemisphere release appears to be a more primary cause of delusional disorder than right hemisphere impairment, the latter merely entailing loss of *inhibition* of delusional beliefs’ (Braun & Suffren 2011: emphasis in original).

10 Cutting 1994b. See also Langdon, Coltheart, Ward *et al* 2002; Mitchell & Crow 2005; Schettino, Lauro, Crippa *et al* 2010; Borod, Martin, Alpert *et al* 1993; Ferman, Primeau, Delis *et al* 1999; Schweitzer 1982; Cohen, Iglesias & Minor 2009.

11 Coltheart, Langdon & McKay 2007. For further detail, see Chapter 4.

12 Ross, Orbelo, Cartwright *et al* 2001.

13 Cutting & Murphy 1990.

14 Bruell & Albee 1962.

15 Hari, Hänninen, Mäkinen *et al* 1998; Mesulam 2000b; Devinsky 2000. See also the extensive evidence for the connexion between somatoparaphrenia and right hemisphere deficits.

16 Tsakiris, Costantini & Haggard 2008; Lyons & Fitzgerald 2013; Allison, Puce & McCarthy 2000; Hein & Knight 2008; Redcay 2008; Carrington & Bailey 2009. For evidence that the right superior temporal sulcus is critical for understanding bodily motion, see Grossman, Battelli & Pascual-Leone 2005; van Kemenade, Muggleton, Walsh *et al* 2012.

17 Frassinetti, Pavani, Zamagni *et al* 2009; Frassinetti, Maini, Romualdi *et al* 2008; Sugiura, Sassa, Jeong *et al* 2008; Kaplan, Aziz-Zadeh, Uddin *et al* 2008; Rosa, Lassonde, Pinard *et al* 2008; Morita, Itakura, Saito *et al* 2008; Farrer, Franck, Georgieff *et al* 2003. The sense of body ownership is highly dependent on the right inferior parietal lobe and the right temporoparietal junction (Ehrsson, Holmes & Passingham 2005; Tsakiris, Costantini & Haggard 2008). Both of these areas are dysfunctional in schizophrenia spectrum disorders (Arzy, Mohr, Michel *et al* 2007; Torrey 2007).

18 In schizophrenia: bodily integrity: McGilchrist & Cutting 1995; biological motion perception: Kim, Park & Blake 2011; self-face recognition: Irani, Platek, Panyavin *et al* 2006; Kircher, Seiferth, Plewnia *et al* 2007. In autism: bodily integrity may be, but is not commonly, compromised; biological motion perception: Freitag, Konrad, Häberlen *et al* 2008; Todorova, Hatton & Pollick 2019; self-face recognition: Uddin, Davies, Scott *et al* 2008.

19 See, eg, Silverstein & Palumbo 1995.

20 For schizophrenia, see Foussias & Remington 2010; Sayers, Curran & Mueser 1996; Mueser, Sayers, Schooler *et al* 1994.

21 For schizophrenia, see Cohen, Iglesias & Minor 2009; Vaskinn, Sundet, Østefjells *et al* 2016.

22 For schizophrenia, see Hough 1990; Stuss, Gallup & Alexander 2001; Stuss & Alexander 2000; Stuss, Picton & Alexander 2001; Stuss 1991b; Gallagher 2003; Tavano, Sponda, Fabbro *et al* 2008.

23 Schneiderman, Murasugi & Saddy 1992.

24 Parnas, Møller, Kircher *et al* 2005.

25 For schizophrenia, see Nathaniel-James & Frith 1996; Simpson & Done 2002.

26 For schizophrenia, see Sarfati, Hardy-Baylé, Besche *et al* 1997; Corcoran, Cahill & Frith 1997; Frith & Corcoran 1996; Pickup & Frith 2001; Saban-Bezael & Mashal 2017; Mitchley, Barber, Gray *et al* 1998; Fukuhara, Ogawa, Tanaka *et al* 2017; Bosco, Berardinelli & Parola 2019.

27 For schizophrenia, see Fukuhara *et al, op cit.*

28 For schizophrenia, see Rossell & Van Rheenen 2013; Fukuhara *et al, op cit.*

29 For right hemisphere damage, see Silverstein & Palumbo 1995. Subjects with right temporal or temporoparietal brain lesions are particularly susceptible (Doyon & Milner 1991; Lansdell 1970;

Robertson, Lamb & Knight 1988), as are Alzheimer's patients with right hemisphere impairment (Massman, Delis, Filoteo *et al*, 1993). For schizophrenia, see Matsue & Okuma 1984; Tomer, Mintz, Levy *et al* 1981.

30 Cutting & Dunne 1989.

31 Doniger, Foxe, Murray *et al* 2002; Doniger, Silipo, Rabinowicz *et al* 2001; Place & Gilmore 1980; Phillips & Silverstein 2003; Silverstein, Knight, Schwarzkopf *et al* 1996; Ferman, Primeau, Delis *et al* 1999. But the problem may be more complex: see note 1592 below.

32 Ferman *et al*, *op cit*.

33 Reich & Cutting 1982.

34 55 out of 60 studies: see Uhlhaas & Silverstein 2005; and the follow-up paper, taking into account a further five years of research, Silverstein & Keane 2011. See also particularly, in addition to papers already mentioned: Andersch, 2016; Brand, Kopmann, Marbach *et al* 2005; Hemsley 1994; Gray, Feldon, Rawlins *et al* 1991; Rabinowicz, Opler, Owen *et al* 1996; Silverstein, Bakshi, Chapman *et al* 1998; Matussek 1987. See also Place & Gilmore 1980; Watt & Phillips 2000; Uhlhaas & Silverstein 2005; Granholm, Perry, Filoteo *et al* 1999; Frith, Stevens, Johnstone *et al* 1983. Dysfunctional perceptual organisation is particularly to be found in chronic patients (Parnas, Vianin, Saebye *et al* 2001). A small number of studies have found a global-processing advantage for schizophrenia patients, eg, Bellgrove, Vance & Bradshaw 2003; Carter, Robertson, Nordahl *et al* 1996; Granholm, Perry, Filoteo *et al* 1999. However, 'a global advantage was found only for the condition in which attention was divided between the local and global levels and there was an equal probability of the target appearing at both levels' (Uhlhaas & Silverstein 2005). On poorer outcomes, see especially Silverstein, Schenkel, Valone *et al* 1998.

35 Uhlhaas & Silverstein 2005 (628: emphasis added).

36 Watt & Phillips 2000.

37 Talamini & Meeter 2009; Talamini, de Haan, Nieman *et al* 2010.

38 Uhlhaas & Silverstein 2005.

39 Silverstein, Knight, Schwarzkopf *et al* 1996.

40 Coleman, Cestnick & Krastoshevsky 2009; Bellgrove, Vance & Bradshaw 2003. This may explain why some studies have even shown what appears at first sight to be a reverse pattern in schizotypy (eg, Granholm, Cadenhead, Shafer *et al* 2002).

41 Silverstein & Keane 2011 (696); Phillips & Silverstein 2003; Borda & Sass 2015.

42 Braver, Barch & Cohen 1999; Cohen & Servan-Schreiber 1992; Borda *et al*, *op cit*; Hemsley 1994; Phillips & Silverstein 2003; Parsons, Gandhi, Aurbach *et al* 2013.

43 Silverstein, Matteson & Knight 1996.

44 Kuperberg, McGuire & David 1998; Spitzer, Breuckers, Beyer *et al* 1994; Silverstein *et al* 1996 *op cit*.

45 See esp, Phillips & Silverstein 2003.

46 Place & Gilmore 1980; Wells & Leventhal 1984.

47 Schizophrenia: Dakin, Carlin & Hemsley 2005; Uhlhaas, Phillips, Schenkel *et al* 2006; Tibber, Anderson, Bobin *et al* 2013. Autism: Happé 1996; Bölte, Holtmann, Poustka *et al* 2007. Not all studies have corroborated this finding – see, eg, Hoy, Hatton & Hare 2004.

48 Kim, Takemoto, Mayahara *et al* 1994.

49 McGilchrist 2009b (392).

50 Garety, Hemsley & Wessely 1991.

51 Garety, Freeman, Jolley *et al* 2005; Garety, Joyce, Jolley *et al* 2013.

52 Menon, Mizrahi & Kapur 2008.

53 Parsons, Gandhi, Aurbach *et al* 2013.

54 Cheung, Chen, Chen *et al* 2002; Mathis, Wynn, Jahshan *et al* 2012; Mathis, Wynn, Breitmeyer *et al* 2011.

55 Schultze-Lutter 2009. Schizophrenic subjects have also been found to be *disorientated* in time (De La Garza & Worchel 1956), but in my view this might simply reflect institutional living. Minkowski pointed out early on: '[A schizophrenic] usually knows the date, but the knowledge has no precise meaning for him; he cannot use it in a fashion appropriate to his circumstances. The *pragmatic* use of things is affected early in this condition' (Minkowski 1987, 197). Yet I have seen a virtually mute inpatient with schizophrenia suddenly state clearly and correctly that his treatment order expired the following day.

56 McGilchrist & Cutting 1995.

57 Nasar 2011 (258).

58 Eg, Gruber, Mangat & Abou-Taleb 1984: 'Twenty-nine of 54 subjects with auditory hallucinations were able, when asked, to localize the voices to the left or right ear. Subjects who heard voices on the right were found to be significantly more depressed than the others'.

59 Schechter 2000 (14): Paul Erdős, the highly eccentric autistic mathematical genius, lived most of his life out of a suitcase and was of no fixed abode; he used to appear at the door of anyone he thought might accommodate him, feed him and otherwise parent him, uttering the words 'my *brain* is open'.

60 When depression becomes psychotic, it seems to involve right hemisphere dysfunction.

61 McGilchrist & Cutting 1995. Karl Jaspers famously spoke of the 'ununderstandable' as a sign of schizophreniform psychosis (Jaspers 1963, 577). While it has been since argued that all delusions are understandable, this usually means resorting to unverifiable and often far-fetched psychodynamic interpretations, and the common sense meaning of Jaspers' description is clearly right.

62 Hypergyria and white matter deficits in the right hemisphere are reported (Narr, Bilder, Kim *et al* 2004; Vogeley, Tepest, Pfeiffer *et al* 2001). There are altered right orbitofrontal sulcal-gyral patterns in the right hemisphere (Nakamura, Nestor, McCarley *et al* 2007; Lavoie, Bartholomeuz, Nelson *et al* 2014). There is white matter reduction in right parietal and subcortical regions (Zetzsche, Preuss, Frodl *et al* 2008). White matter growth is slower in the right hemisphere of very early onset patients as compared with healthy controls (Gogtay, Lu, Leow *et al* 2008). The superior longitudinal fasciculus, a crucial integrating white matter tract, is compromised in the right hemisphere (Rowland, Spieker, Francis *et al* 2009). There are abnormalities of grey matter in the right inferior parietal lobe (Shapleske, Rossell, Chitnis *et al* 2002). There is grey matter reduction in the right insular region (Takahashi, Wood, Yung *et al* 2009). There are reduced neuronal connexions to the right thalamus (Mileaf & Byne 2012). Cognitive deficits in schizophrenia correlate closely with diminished grey matter volumes in specifically the right hippocampus (Liu, Li, Liu *et al* 2020). However, one study found abnormalities of gyrification in both hemispheres, with hypogyria being commoner in the left (Palaniyappan & Liddle 2012).

63 Yuasa, Kurachi, Suzuki *et al* 1995.

64 Schott, Voss, Wagner *et al* 2015.

65 Riehemann, Volz, Stützer *et al* 2001; Hook, Gordon, Lazzaro *et al* 1995; Malaspina, Bruder, Furman *et al* 2000.

66 Deicken, Calabrese, Merrin *et al* 1994.

67 Gallinat, Winterer, Herrmann *et al* 2004. There is lower amplitude of the N160 complex in the right hemisphere (Endrass, Mohr & Rockstroh 2002), a result that is interpreted as a consequence of the loss of rapidly conducting myelinated axons in the right hemisphere. The (normally) more rapid right-to-left interhemispheric transfer times are comparatively slower in patients with schizophrenia (Endrass, Mohr & Rockstroh 2002; Barnett, Corballis & Kirk 2005).

68 Lacroix, Chaput, Rodriguez *et al* 1995.

69 Dolina, Efimova, Kildyushov *et al* 2017.

70 Schizophrenia: see, eg, Barta, Petty, McGilchrist *et al* 1995; Barta, Pearlson, Brill *et al* 1997; Tiihonen, Katila, Pekkonen *et al* 1998; Petty 1999; Mitchell & Crow 2005; Rentería 2012; McKenna, Babb, Miles *et al* 2020; Sun, Chen, Collinson *et al* 2017; Fallgatter & Strik 2000; Hori, Ozeki, Terada *et al* 2008. See also Spironelli, Angrilli & Stegagno 2008; Dollfus, Razafimandimby, Delamillieure *et al* 2005; Sommer, Ramsey & Kahn 2001; Weiss, Hofer, Golaszewski *et al* 2006; Sommer, Ramsey, Mandl *et al* 2003. Autism: Carper, Treiber, DeJesus *et al* 2016; Postema, van Rooij, Anagnostou *et al* 2019.

71 Endrass, Mohr & Rockstroh 2002; Nowicka & Tacikowski 2011; Barnett, Corballis & Kirk 2005.

72 Rotarska-Jagiela, van de Ven, Oertel-Knöchel *et al* 2010; Jalili, Meuli, Do *et al* 2010; Ke, Zou, Shen *et al* 2010; Andreou, Nolte, Leicht *et al* 2014. However, as the same study shows, chronic patients with more pronounced negative symptoms show increased rightward asymmetry of functional connectivity: with disease progression, the left hemisphere symptoms and function appear to ‘burn out’.

73 Petty 1999; Barta, Petty, McGilchrist *et al* 1995; Petty, Barta, Pearlson *et al* 1995; Barta, Pearlson, Brill *et al* 1997; Spironelli, Angrilli & Stegagno 2008; Dollfus, Razafimandimby, Delamillieure *et al* 2005; Sommer, Ramsey & Kahn 2001; Weiss, Hofer, Golaszewski *et al* 2006; Sommer, Ramsey, Mandl *et al* 2003; Oertel, Knöchel, Rotarska-Jagiela *et al* 2010. There is also a similar reduction in leftward asymmetry in this area in the relatives of those with schizophrenia (Oertel-Knöchel, Knöchel, Matura *et al* 2013). For discussion of asymmetry of the planum temporale, see McGilchrist 2009b (23, 465 & 485).

74 One of many findings that suggest this possibility is that inability to appreciate music is related to greater cortical thickness in the left temporal region in normal subjects, and to lesser cortical thickness in the left temporal region in schizophrenia (Fujito, Mineise, Hatada *et al* 2018).

75 Dias 2012.

76 Relation between corpus callosum morphology and schizophrenia: David 1994; Woodruff, Pearlson, Geer *et al* 1993; Woodruff, McManus & David 1995; Cogger & Serafetinides 1990; Rosenthal & Bigelow 1972; Günther, Petsch, Steinberg *et al* 1991; Swayze, Andreasen, Erhardt *et al* 1990; Arnone, McIntosh, Tan *et al* 2008; Walterfang, Wood, Reutens *et al* 2008; Walterfang, Wood, Reutens *et al* 2009; Bersani, Quartini, Iannitelli *et al* 2010. Relation between agenesis of the corpus callosum and schizophrenia: Hallak, Crippa, Pinto *et al* 2007; Motomura, Satani & Inaba 2002. Relation between callosal agenesis and delusional syndromes: Görgülü, Alparslan & Uygur 2010; Bhatia, Saha & Doval 2016.

77 David 1994. The article is a concise and thoughtful survey of problems typically associated with making clear connexions between the callosum and schizophrenia.

78 Specifically the right superior longitudinal fasciculus, right middle longitudinal fasciculus, and right uncinate fasciculus, but also the left thalamo-occipital fasciculus (Joo, Yoon, Shon *et al* 2018; Kubicki, McCarley & Shenton 2005). And see Chapter 6 for further details.

79 Rockstroh & Lutzenberger 1987; Gur & Gur 1987. EEG studies show increases in power in the left hemisphere, especially frontal areas, including the cingulate cortex (Andreou, Faber, Leicht *et al* 2014; Bochkarev, Kirenskaya, Tkachenko *et al* 2015). A left-sided ictal (hyper-excitable) focus is

associated with a schizophrenia-like psychosis, while a right-sided focus is associated more with depression (Oyeboode 2008; Sherwin, Peron-Magnan, Bancaud *et al* 1982; Perez, Trimble, Murray *et al* 1985; Sherwin 1981; Flor-Henry 1969a; Kan, Mori, Suzuki *et al* 1989). Patients with schizophrenia (and bipolar disorder) may display left-lateralisation of the normal right-lateralised temporal lobe response to emotional expression in speech (Mitchell, Elliott, Barry *et al* 2004).

80 Raine, Andrews, Sheard *et al* 1989; Saban-Bezael & Mashal 2017.

81 See, for example, Gur, Resnick, Alavi *et al* 1987; Goldman-Rakic & Selemon 1997; van Veelen, Vink, Ramsey *et al* 2010; Jibiki, Matsuda, Yamaguchi *et al* 1992. One interesting corroboration is that eye-blink rate is a recognised marker of dopaminergic function: higher levels of dopamine are associated with increased eye-blinking (see, eg, Karson 1983; Kleven & Koek 1996). Not surprisingly, therefore, schizophrenic subjects also have high eye-blink rates (Karson, Dykman & Paige 1990; Mackert, Flechtner, Woyth *et al* 1991). In such high-dopamine subjects the normal asymmetry of attention in favour of the left visual field (right hemisphere) is reversed (Slagter, Davidson & Tomer 2010). Equally, inattention to the left visual field, commonly found in ADHD, is reversed by *blocking* dopamine transmission (Sheppard, Bradshaw, Mattingley *et al* 1999). Autistic subjects also have elevated rates of eye-blinking (Goldberg, Maltz, Bow *et al* 1987).

82 Glick, Ross & Hough 1982; Tucker & Williamson 1984; Mintz, Tomer & Myslobodsky 1982; Wagner, Burns, Dannals *et al* 1983; Laurian, Gaillard, Le *et al* 1983; Gottfries, Perris & Roos 1974. See, however, Tomer & Flor-Henry 1989 for a reverse finding.

83 Farde, Wiesel, Stone-Elander *et al* 1990; Nozaki, Kato, Takano *et al* 2009.

84 Heinrichs & Zakzanis 1998; Amminger, Schlögelhofer, Lehner *et al* 2000.

85 Kravariti, Touloupoulou, Mapua-Filbey *et al* 2006.

86 Oepen, Harrington, Spitzer *et al* 1989.

87 McCourt, Shpaner, Javitt *et al* 2008.

88 Levine, Toder, Geller *et al* 2012.

89 Nagara, Ohara & Yano 1996. Also relevant is a paper by Jensen & Larsen (1979). This report includes three schizophrenia-like psychotic patients. One ('patient 72') was psychotic, and the psychosis was relieved by left temporal lobectomy. Another ('patient 11') was non-psychotic, and the psychosis was precipitated by right temporal lobectomy. The third ('patient 44'), however, was pre-operatively psychotic and her psychosis was relieved by right temporal lobectomy.

90 Mancini, Presenza, Di Bernardo *et al* 2014. See also, for example, Wyrsh 1949; Binswanger 2010; Parnas & Bovet 1991; Stanghellini & Ballerini 2004; Sass & Pienkos 2013c.

91 Kanner 1943 (248). For confirmation, see Mizuno, Liu, Williams *et al* 2011.

92 Kanner 1943 (246).

93 Phillips & Silverstein 2003; Pellicano, Gibson, Maybery *et al* 2005.

94 See, eg, Plaisted, Swettenham & Rees 1999; Vladusich, Olu-Lafe, Kim *et al* 2010.

95 Robertson, Thomas, Kravitz *et al* 2014; Rinehart, Bradshaw, Moss *et al* 2000; Shah & Frith 1983; Plaisted, O'Riordan & Baron-Cohen 1998; Behrmann, Avidan, Leonard *et al* 2006.

96 Kanner 1943.

97 Happé & Frith 2006.

98 Gillberg 1983; Huke, Turk, Saeidi *et al* 2013; Treasure 2013; Zucker, Losh, Bulik *et al* 2007; Baron-Cohen, Jaffa, Davies *et al* 2013; Tchanturia, Smith, Weineck *et al* 2013; Courty, Maria, Lalanne *et al* 2013; Gillberg, Billstedt, Wentz *et al* 2010; Koch, Larsen, Mouridsen *et al* 2015.

99 Mizuno, Liu, Williams *et al* 2011.

- 100** Whitney, Huber, Klann *et al* 2009.
- 101** Lyons & Fitzgerald 2007 & 2013; Schore 1994, 2003, 2012 & 2014a; Klin, Volkmar, Sparrow *et al* 1995; Gunter, Ghaziuddin & Ellis 2002.
- 102** Wolff 1991 (617).
- 103** Dahlgren & Gillberg 1989.
- 104** Nadig, Ozonoff, Young *et al* 2007.
- 105** Osterling & Dawson 1994.
- 106** Baron-Cohen, Cox, Baird *et al* 1996.
- 107** Dawson & Adams 1984.
- 108** Mundy & Crowson 1997.
- 109** Hobson 1995.
- 110** Lyons & Fitzgerald 2013.
- 111** *ibid* (248–50).
- 112** Schore 1996; Fernald 1989; Meltzoff & Brooks 2001.
- 113** Lyons & Fitzgerald 2013; Schore 2014a.
- 114** Schore 2014a; Schore 2019 (82).
- 115** Findings include enlargement of the right amygdala (Yirmiya & Charman 2010) and smaller right anterior cingulate volume (Haznedar, Buchsbaum, Wei *et al* 2000). Emotional face processing deficits in autism are associated with abnormal activity in the right amygdala and insula (Monk, Weng, Wiggins *et al* 2010).
- 116** Carper, Treiber, DeJesus *et al* 2016.
- 117** Pantelis, Byrge, Tyszkla *et al* 2015.
- 118** Lombardo, Chakrabarti, Bullmore *et al* 2011.
- 119** Chien, Lin, Lai *et al* 2015.
- 120** Alexander, Lee, Lazar *et al* 2007; Barnea-Goraly, Kwon, Menon *et al* 2004; Chung, Dalton, Alexander *et al* 2004; Just, Cherkassky, Keller *et al* 2007; Piven, Bailey, Ranson *et al* 1997; Fiebelkorn, Foxe, McCourt *et al* 2013.
- 121** McGrath, Johnson, O’Hanlon *et al* 2013.
- 122** Stroganova, Nygren, Tsetlin *et al* 2007.
- 123** Maxwell, Villalobos, Schultz *et al* 2015.
- 124** Coben, Clarke, Hudspeth *et al* 2008; Machado, Estévez & Leisman 2015.
- 125** Wang, Barstein, Ethridge *et al* 2013.
- 126** Boutros, Lajiness-O’Neill, Zillgitt *et al* 2015.
- 127** See, eg, Iturria-Medina, Fernández, Morris *et al* 2011.
- 128** Glass, Shaw, Ma *et al* 2008.
- 129** van der Knaap & van der Ham 2011.
- 130** Barr, Hamm, Kirk *et al* 2005; Hsu, Duann, Chen *et al* 2013; Glickstein 2009; Sauerwein & Lassonde 1983; Lassonde, Sauerwein & Lepore 1995.
- 131** Sanders 1989; Banich & Brown 2000; Paul, VanLancker-Sidtis, Schieffer *et al* 2003; Brown, Symington [‘Symington’], VanLancker-Sidtis *et al* 2005; Huber-Okraïne, Blaser & Dennis 2005.

- 132** Paul, Schieffer & Brown 2004; Brown & Paul 2000; Symington, Paul, Symington *et al* 2010.
- 133** Symington, Paul, Symington *et al* 2010; Turk, Brown, Symington *et al* 2010.
- 134** Brown & Paul 2000.
- 135** O'Brien 1994.
- 136** Buchanan, Waterhouse & West 1980.
- 137** Brown & Paul 2000.
- 138** Paul, Corsello, Kennedy *et al* 2014. However, somewhat fewer met full formal diagnostic criteria once parental reports of childhood behaviour were taken into account.
- 139** Just, Cherkassky, Keller *et al* 2007; Vidal, Nicolson, DeVito *et al* 2006; He, Duan, Karsch *et al* 2010.
- 140** See Paul, Corsello, Kennedy *et al* 2014 for a comprehensive review.
- 141** Egaas, Courchesne & Saitoh 1995; Manes, Piven, Vrancic *et al* 1999; Boger-Megiddo, Shaw, Friedman *et al* 2006; Alexander, Lee, Lazar *et al* 2007.
- 142** Barnea-Goraly, Kwon, Menon *et al* 2004. There are two possible ways by which this might come about, and at present I do not know of evidence that would help distinguish the possibilities. One depends on the facilitatory role of the corpus callosum, the other on its important role in inhibition (see, eg, David 1993; Whitfield-Gabrieli, Thermenos, Milanovic *et al* 2009). Abnormalities may have the overall effect of impairing the capacity for one hemisphere to inhibit the other. Remember that facilitatory transmission in schizophrenia is enhanced relative to inhibitory transmission (Stone, Morrison & Pilowsky 2007; Javitt 2007; Morgan & Curran, 2006; Krystal, Karper, Seibyl *et al* 1994). In other words, in the absence of a normally functioning corpus callosum, either the right hemisphere cannot contribute adequately to left hemisphere function, or it cannot adequately inhibit the left hemisphere from interfering in right hemisphere function. Or both. Each would lead to a similar picture.
- 143** Danguécan & Smith 2019; Teuber 1974; Sperry 1973 (214); Sandson, Manoach, Price *et al* 1994; Silva, Sakamoto, Thomé *et al* 2020; Mariotti, Iuvone, Torrioli *et al* 1998; Lansdell 1969; Muter, Taylor & Vargha-Khadem 1997.
- 144** Kinsbourne 1988 (139). See also Kinsbourne 1975; and Lempert & Kinsbourne 1982.
- 145** von Monakow 1914 (27).
- 146** Carrera & Tononi 2014. See also Coslett, Bowers & Heilman 1987; Metter, Riege, Hanson *et al* 1983; Metter, Riege, Hanson *et al* 1984; Bosley, Rosenquist, Kushner *et al* 1985.
- 147** Stangeland, Orgeta & Bell 2018.
- 148** See, eg, Ido, Badran, Dmytruk *et al* 2018; Richardson 1992; Beniczky, Kéri, Vörös *et al* 2002; Akıncı, Öncü & Topçular 2016.
- 149** Stanghellini 2004 (1–2).
- 150** Cutting & Dunne 1989.
- 151** Sass & Parnas 2003 (438).
- 152** Patient reported by Bin Kimura, as cited in Fuchs 2013 (75: emphasis added).
- 153** McGilchrist & Cutting 1995.
- 154** *ibid.*
- 155** Parnas, Møller, Kircher *et al* 2005.
- 156** Schreber 1955 (138).
- 157** Gall 1835, vol 2 (165). Notwithstanding, Gall describes her as ‘a woman of infinite sense’.

158 These have all been demonstrated in the earlier chapters of Part I; for a brief overview of problems of the self in right hemisphere impairment, see Feinberg 2013.

159 Cutting 1994a (76).

160 Laing 1963.

161 Minkowski 2002 (144). As he reports, these observations were first made in this form by his wife, Françoise Minkowska-Brokman: « *la vie chez lui est opposée au plan; l'instinct est opposé au cerveau; le senti est opposé au pensé; la faculté de la pénétration qui synthétise est opposée à l'analyse des détails infimes; là où nous nous fions aux impressions, lui exige des preuves; le mouvement s'oppose chez lui à l'immobilité; les événements et personnes s'opposent aux objets; la réalisation s'oppose à la représentation; le but s'oppose à la base; le temps s'oppose à l'espace; la succession s'oppose à l'extension. Les facteurs indiqués dans la première colonne de ce schéma font défaut, ceux de la seconde, par contre, sont hypertrophiés* » (Minkowska 1925, 135).

162 Kuhn 1952, quoted in Cutting 2002 (162).

163 Grandin 2009.

164 Minkowski 2004 (128 & 136).

165 Mancini, Presenza, Di Bernardo *et al* 2014.

166 Kanner 1943 as above. See also Booth & Happé 2010.

167 Saks 2007 (13).

168 McGhie & Chapman 1961 (104–5).

169 Matussek 1987 (92).

170 Minkowska 1925 (130: emphasis in original): « *Ainsi toute son activité est réglée par l'idée du plan qui forcément ne s'applique qu'aux objets immuables; l'ensemble échappe à notre malade, il ne voit que les parties isolées et ne progresse point. Pour élaborer son plan, il ne se sert que de ses forces cérébrales, car l'instinct, comme il le dit, lui fait défaut. Un jour, il est question de musique; il déclare que ce n'est pour lui qu'une succession de sons; 'Je ne sais pas sentir, il faut que tout passe par le cerveau'.* »

171 Matussek 1987 (92).

172 Arieti 1962 (463).

173 Chapman 1966 (229).

174 Stanghellini 2004 (4).

175 Chapman 1966 (229).

176 McGhie & Chapman 1961 (106).

177 *ibid* (emphasis added).

178 Spitzer 1988 (167).

179 Martin & Pacherie 2013; Sass 2004.

180 Chapman 1966.

181 Sass & Pienkos 2013b.

182 Stanghellini 2004 (150–2).

183 Angyal 1936 (1042). Cf Ehrenwald's right hemisphere-damaged patient.

184 Bleuler 1978 (490).

185 Sass 2001 (256).

186 Feyerabend 1975 (45 n).

187 Blankenburg 1971 (54); quoted in Sass 2001 (251).

188 Patient reported by Bin Kimura, as in Fuchs 2013 (75: emphasis added).

189 Fuchs *op cit*.

190 Merleau-Ponty 1945: « *le sujet et l'objet [apparaissent] comme deux moments abstraits d'une structure unique qui est la présence* » (492: emphasis in original).

191 Sass 2017 (340–1).

192 Kimura 1994.

193 Bleuler 1950 (143).

194 Cutting 1997 (252).

195 Schilder 1935 (159).

196 Chapman 1966 (232).

197 Henriksen & Nordgaard 2016 (266).

198 See McGilchrist 2016.

199 Feinberg 2013. See also Feinberg 2011; Decety, Chaminade, Grèzes *et al* 2002.

200 Iacoboni, Woods, Brass *et al* 1999.

201 Cutting 1997 (318).

202 A diminished sense of self and tendency to blame others are also features of borderline personality disorder. Here, too, it has been posited that the core deficits are in the right hemisphere – see, eg, Meares, Schore & Melkonian 2011; Chanen, Velakoulis, Carison *et al* 2008; Irle, Lange & Sachsse 2005; Irle, Lange, Weniger *et al* 2007; de la Fuente, Goldman, Stanus *et al* 1997. But there are some findings of left hemisphere abnormalities (eg, Whittle, Chanen, Fornito *et al* 2009) and the findings are made harder still to interpret because studies involving both male and female subjects analysed separately are unusual, the diagnosis is not always robust, and abnormalities may be represented by both larger and smaller volumes than usual, and by both under- and over- activity.

203 Minkowski 2002 (122: emphasis added in translation): « *Tout est immobilité autour de moi. Les choses se présentent isolément, chacune pour soi, sans rien évoquer. Certaines choses qui devraient former un souvenir, évoquer une immensité de pensées, donner un tableau, restent isolées. Elles sont plutôt comprises qu'éprouvées. C'est comme des pantomimes, pantomimes qu'on jouerait autour de moi, mais je n'y entre pas, je reste en dehors. J'ai mon jugement, mais l'instinct de la vie me manque. Je ne parviens plus à donner mon activité d'une façon suffisamment vivante. Je ne puis plus passer des cordes douces aux cordes tendues, et pourtant on n'est pas fait pour vivre sur le même thème. J'ai perdu le contact avec toutes espèces de choses. La notion de la valeur, de la difficulté des choses a disparu. Il n'y a plus de courant entre elles et moi, je ne peux plus m'y abandonner. C'est une fixité absolue autour de moi. J'ai encore moins de mobilité pour l'avenir que pour le présent et le passé. Il y a en moi comme une sorte de routine qui ne permet pas d'envisager l'avenir. Le pouvoir créateur est aboli en moi. Je vois l'avenir comme répétition du passé* ».

204 Sass 2017 (xi).

205 Jaspers 1963 (81).

206 Schreber was an appellate judge in late nineteenth-century Dresden, whose highly articulate accounts of the onset of schizophrenia in middle age became the focus of Freud's only major study of a psychotic illness – see Sass 1994 (esp here 93).

207 Sass 2017 (x).

208 Vogeley & Fink 2003.

209 Patient quoted in Parnas 2000.

- 210** Bleuler 1950 (41).
- 211** Minkowski 1987 (209)
- 212** Cutting 1999 (emphasis added).
- 213** See Sass 2017 (241–4). And for further discussion see McGilchrist 2009b (esp 67ff).
- 214** Stanghellini, Ballerini, Blasi *et al* 2014.
- 215** Minkowska 1925 (134–5).
- 216** Minkowski 2004 (135).
- 217** Sass 2001.
- 218** Giliarovsky 1957/1980 (73). Cited in this form in Sass 2017 (406, n24).
- 219** See Dide & Guiraud 1929 (236); Balken 1943 (255); Minkowski 1970 (275).
- 220** Beißner 1947 (7: emphasis added). However, as he points out, Hölderlin did continue to use what Beißner calls the ‘generalising’ conjunction ‘wenn’ (which can mean ‘when’, ‘whenever’ or ‘if’): » *er eigentlich nie einen einmaligen Vorgang in seiner Besonderheit zeichnet, sondern immer nur das Typische sieht, wie es sich aus hundert Beobachtungen in widerspruchslloser Gültigkeit heraushebt. Das wird bezeugt durch die eigentümliche Vorliebe für die verallgemeinernde Konjunktion ‚wenn‘.* «
- 221** See Jakobson & Lübke-Grothues 1985 (139).
- 222** Sass 2017 (11: emphasis in original).
- 223** Cohen 1978 (18: emphasis added).
- 224** Rochester & Martin 1979 (195).
- 225** Arseni & Dănilă 1977; Yamadori, Mori, Tabuchi *et al* 1986; Frey & Lambert 1972; Braun, Dumont, Duval *et al* 2004.
- 226** Freud 1915 (200).
- 227** Freud 1975 (159): » *Fragen wir uns, was der schizophrenen Ersatzbildung und dem Symptom den befremdlichen Charakter verleiht, so erfassen wir endlich, daß es das überwiegen der Wortbeziehung über die Sachbeziehung ist.* «
- 228** Shimkunas 1972.
- 229** See Cutting, Moreira, Naudin *et al* 2017.
- 230** Freud 1919 (123).
- 231** Freud 1915 (204). He continues: ‘If we have made a true assessment of the nature of the unconscious ... then our researches will inevitably bring us back from many other points to this same piece of insight.’
- 232** Sechehaye 1994 (55 & 83).
- 233** Tatossian 2014b (139–40): » *En son essence, la perception est incomplète: par là même, elle est une action, un effort même si cet effort n’est pas ‘senti’ psychologiquement et ceci implique que quelqu’un perçoit, que quelqu’un agit, que quelqu’un est là qui centre cette perception, lui permet d’être ce qu’elle doit être : incomplète, justement en la complétant inlassablement. Et ce quelqu’un est le sujet percevant* ».
- 234** Nagel 1986.
- 235** Kuhn 1952: » *Der Wahn ist mit andern Worten ein misslungener Versuch, zu einer Verendlichung des Daseins und zu einer endlichen, eigentlichen Zeitgang zu gelangen.* «
- 236** Sass 1994 (106).

- 237** Sass & Pienkos 2015a, quoting Antonin Artaud from Sontag 1976 (362).
- 238** Cutting 1999.
- 239** de Haan & Fuchs 2010.
- 240** Cutting 1997 (281).
- 241** Fischer 1929 (560: emphasis added).
- 242** Whitehead 1919 (195).
- 243** Minkowski 1926.
- 244** Minkowski 1987 (191).
- 245** Minkowski 2002 (107): « *Ce qui vient d'être dit suffit pour rendre probable, tout au moins, que le contact vital avec la réalité concerne le dynamisme intime de notre vie. Les concepts rigides de notre pensée spatiale ne sauraient l'atteindre. Les métaphores semblent être bien plus à leur place ici que les définitions. Ce sont elles qui sont appelées à rendre plus claire la notion du contact vital avec la réalité* ».
- 246** Minkowski 1970 (276: emphasis added).
- 247** Babinski 1914; Denny-Brown, Meyer & Horenstein 1952; Hécaen, de Ajuriaguerra & Massonet 1951.
- 248** Parnas, Møller, Kircher *et al* 2005.
- 249** Tatossian 2014a (35): « *Mon cerveau ... est devenu comme une sorte de boîte à pensées* ».
- 250** Schwartz, Wiggins, Naudin *et al* 2005.
- 251** Cutting 1999.
- 252** Walser 2015 (137–41). However, Cézanne himself used to quote with appreciation a line of Lamartine's: « *Objets inanimés: avez-vous donc une âme / Qui s'attache en notre âme et la force d'aimer?* » – 'Inanimate objects: have you, then, a soul, which cleaves to our soul, and compels it to love?' (Lamartine, *Harmonies poétiques et religieuses*, Ilme Harmonie, 'Milly ou la terre natale', lines 15–16). Perhaps Walser saw this, too, as part of the picture, because he also wrote of how the painter 'commiserated' with apples – 'was sorry for them, on account of their being unable to have any conception of themselves'.
- 253** Minkowski 1987.
- 254** Bleuler 1950 (123).
- 255** Jaspers 1963 (122).
- 256** Cutting 1999.
- 257** Sass 2017 (xiii).
- 258** Parnas & Handest 2003 (127).
- 259** Kimura 2001.
- 260** Cutting 1997 (113).
- 261** Laforgue & Allendy 1924 (87): « *Les choses autour de moi sont comme mortes, comme des maisons inhabitables. Ce ne sont pas des ruines, car ces dernières ont leur poésie. Non, je suis insensible à tout cela. Je fais tout parce que je dois le faire. Je mange avec effort, car la vie matérielle ne m'intéresse pas. Je fais semblant d'aimer, je fais les gestes, mais n'en éprouve aucun sentiment. Parfois je voudrais bien être comme les autres, mais cela ne va pas. Le monde me laisse indifférente. Les hommes sont des 'cadavres automates', et ma mère est une poupée gloutonne.* »
- 262** Stanghellini 2004 (191).

- 263** Cutting 2002 (184).
- 264** Tatossian 2014a (61).
- 265** Young & Leafhead 1996 (162).
- 266** Cutting 1999.
- 267** Rosser 1979 (178 & 184).
- 268** Sechehaye 1994 (55–6).
- 269** *ibid* (59–60).
- 270** Minkowski 1987 (194: emphasis added).
- 271** Wyndham Lewis 1918 (295).
- 272** de Haan & Fuchs 2010.
- 273** Blankenburg 1971 (47): » *Dann bleibt mir nichts, als mich auf Vernunftsgründe zu verlassen* «.
- 274** Fischer 1929 (563): » *Ich bin wie eine Maschine, die auf der Stelle steht und arbeitet. Es wird gearbeitet, daß beinahe Alles zerreißt, aber es bleibt stehen.* «
- 275** Minkowski 1970 (278). See also Minkowski 2002 (128).
- 276** Sass 2017 (330).
- 277** *ibid* (270).
- 278** Wallace 1965 (23).
- 279** Coate 1965 (101). The opening page of Isherwood’s modernist classic *Goodbye to Berlin* contains the words: ‘I am a camera with its shutter open, quite passive, recording, not thinking ... Some day, all this will have to be developed, carefully printed, fixed.’ This prompted the title of the Broadway play based on Isherwood’s book, *I Am a Camera*, in turn giving rise to my favourite review of all time, from Walter Kerr in the *New York Herald Tribune*, consisting of simply: ‘Me no Leica’.
- 280** de Haan & Fuchs 2010.
- 281** Sass 2017 (280).
- 282** Stanghellini & Ballerini 2007 (138).
- 283** Stanghellini 2004 (5).
- 284** Minkowski 2004 (136).
- 285** Stanghellini & Ballerini 2007 (136).
- 286** Blankenburg 1971 (68): » *Als ob ich das ganze Weltgetriebe so von außen anschau.* «
- 287** Descartes 1973, vol 1 (99).
- 288** Minkowska 1925 (128): « *[Ils] assistent en spectateurs à la vie se déroulant tout autour d’eux; ils n’agissent, ni ne sentent pas* ».
- 289** Tatossian 2014a (81): « *Ce monde qui s’ambitionne théâtre de marionnettes* ».
- 290** Aviv 2010 (46). See Sass & Pienkos 2015b.
- 291** Sechehaye 1994 (29ff).
- 292** Schilder 1935 (159).
- 293** Mori 1970.
- 294** Cutting 1999.
- 295** Minkowski 1999 (326ff), as in Sass 2001 (256).

296 Eliot, 'Whispers of immortality'.

297 Leader 2012 (222).

298 Tatossian 2014a: « *Je suis une femme entièrement transparente. (Je suis ainsi contactée par les Scientifiques du moment qui peuvent enregistrer tous les Mouvements de ma circulation du sang – mon cœur – poumons – vessie – viscères.)* » (35); and: « *Toutes les réactions naturelles ou provoquées du corps humain peuvent toutes être reproduites sur un tableau tel une carte d'état-major du corps humain* » (94).

299 Jaspers 1963 (117).

300 Sass & Borda 2015.

301 Tatossian 2014a (76–7) : « *Pour Hélène la nature est Néant car elle se place irréparablement en dehors du monde, vécu comme exclusivement 'complexe référentiel d'outils'. En aucun passage du mémoire, même lors de certaines envolées lyriques, la nature n'apparaît: Hélène n'a pas 'le sentiment de la nature' et cette absence a valeur existentielle et non purement littéraire. Les espaces favoris d'Hélène sont les espaces des villes; mieux, ce sont les seuls espaces qu'elle peut 'prendre au sérieux'* ».

302 *ibid* (77).

303 Dide & Guiraud 1929 (224): « *L'affection se caractérise par un fléchissement d'emblée et précoce des sources instinctives de la vie mentale ... l'affaiblissement de l'élan vital et de l'affectivité étant l'élément nécessaire et suffisant pour caractériser la maladie.* »

304 Nietzsche 1956 (217).

305 Nietzsche 1999 (4 & 109).

306 Schwartz, Wiggins, Naudin *et al* 2005.

307 de Haan & Fuchs 2010.

308 Kretschmer 1925 (177).

309 Binswanger 2010 (35ff): » *Ein Vater legt seiner krebskranker Tochter einen Sarg unter den Weihnachtsbaum.* «

310 Blankenburg 1966: » *Schwierige, intellektuell besonders hohe Anforderungen stellende Aufgaben werden dagegen zu diesem Zeitpunkt oft noch ohne große Mühe bewältigt, vor allem solche Aufgaben, deren Aufgabencharakter festliegt, die keiner Interpretation bedürfen. Gelegentlich ziehen sich Kranke in diesem Frühstadium sogar auf das Studium der Mathematik oder Physik zurück. Die vom common sense behütete ‚natürliche Konsequenz‘ versuchen sie durch mehr oder weniger raffinierte logische Ableitungen zu ersetzen.* «

311 Kuhn 1952: » *Er lehnt ‚ein Leben, das nicht und nirgends zu definieren ist‘ ab ... Die Grundrichtung der Tätigkeit des Kranken darin liegt, zuhandenes Zeug aus seinem bewegten Bezug im lebendigen Umgang in bloße Vorhandenheit zu verwandeln* ». I am indebted to Cutting's treatment of the patient (Cutting 2002, 160–2).

312 Minkowski 1970 (278). Such patients recall Nietzsche's descriptions of the Apollonian (and Socratic) mind-sets. Apollo enjoins the seeking of self-knowledge through detached contemplation; Socrates transforms this into 'logical schematism' (Nietzsche 1956, 65 & 88).

313 Mancini, Presenza, Di Bernardo *et al* 2014.

314 Blankenburg 1971 (*passim*); Sass 2017 (175).

315 Blankenburg 1971 (43); as reported in Kim, Takemoto, Mayahara *et al* 1994 (434).

316 Kim, Takemoto, Mayahara *et al* 1994.

317 Colbert & Peters 2002.

318 Parnas, Møller, Kircher *et al* 2005.

319 Minkowski 2002 (141–2: emphases in original): « *Le plan c'est tout pour moi dans la vie* », nous dit encore le malade. « *Je ne veux à aucun prix déranger mon plan, je dérange plutôt la vie que le plan. C'est le goût pour la symétrie, pour la régularité qui m'attire vers mon plan. La vie ne montre ni régularité, ni symétrie et c'est pour ça que je fabrique la réalité. C'est au cerveau que j'attribue toutes mes forces ... Ce que je vais dire paraîtra formidable, mais cela est. Mon état d'esprit actuel consiste à n'ajouter foi qu'à la théorie. Je ne crois à l'existence d'une chose que lorsque je l'ai démontrée. Par exemple, le corps de la femme produit une impression sur l'homme. Pourquoi? Voilà une chose dont je doute, parce que je ne peux pas arriver à la démontrer. Je ne me vois pas arraché par cela, emporté dans l'existence sans point d'appui et me fiant uniquement à mes impressions.* »

320 Rosser 1979 (182).

321 Blankenburg 1971 (46).

322 Sass & Parnas 2001.

323 Blankenburg 1971 (41).

324 Minkowski 1987 (210).

325 Bürgy 2003: as quoted in Fuchs 2005.

326 Leader 2012 (72).

327 Cutting & Murphy 1990.

328 Schwartz, Wiggins, Naudin *et al* 2005.

329 Robbins 2011 (188).

330 Leader 2012 (63).

331 Chapman 1966 (239); and McGhie & Chapman 1961 (107–8).

332 Malaspina, Simon, Mujica-Parodi *et al* 2003.

333 Minkowska 1925 (130): « *Car tout doit correspondre à un plan arrêté d'avance: 'il ne peut pas se fier au hasard', dit-il, 'il faut tout prévoir'* ».

334 Minkowski 2004 (135).

335 Binswanger 1987 (83, 84 & 85: emphasis in the original).

336 See Chapter 22 below.

337 Sechehaye 1994 (53, 89).

338 Schreber 1903 (70, 73): » *Auf dem Dresdener Bahnhof sah ich allerdings eine größere Anzahl von Menschen, die den Eindruck von Eisenbahnpassagieren machten ... flüchtig hingemachten Männer[n].* «

339 Sass 2017 (75).

340 Demay & Renaux 1919.

341 de Haan & Fuchs 2010 (330).

342 Binswanger 1987 (86: emphasis added).

343 Mancini, Presenza, Di Bernardo *et al* 2014.

344 Minkowska 1925 (138): « *Je suis parvenu à me détacher de la matérialité et je me détermine dans mes actes par des principes impersonnels. Je réagis, non pas sous l'influence d'un milieu restreint, mais du monde entier. Je vivais pour l'idée et voyais les hommes impersonnellement. Je*

m'étais intégré par la pensée, non pas aux hommes, mais à l'humanité et cherchais à me rapprocher le plus possible de l'absolu. J'avais noyé mon amour filial dans un amour plus grand ».

345 Tatossian 2014a (36).

346 *ibid* (37).

347 *ibid* (43).

348 Minkowska 1925 (131): « *C'est une conséquence fatale du comportement de l'individu qui ne sent pas, qui n'agit pas, qui ne se fie pas à ses impressions, mais qui pense seulement, réfléchit, analyse, cherche des preuves, n'embrasse jamais l'ensemble, mais décompose tout en petits détails, de sorte que tout se réduit à une représentation mentale* ».

349 Both Minkowski and Jaspers quoted this passage. Fischer 1929 (568: emphasis added in translation): » *Ich war wie abgeschnitten von meiner eigenen Vergangenheit. Als sei es nie so gewesen, so schattenhaft ... Dann schlug die Vergangenheit um. Alles ging durcheinander, aber nicht in greifbarer Weise ... wie wenn ein Gemälde mit perspektivischem Tiefenraum flächenhaft wird und zusammenschnellt* ».

350 Bleuler 1950 (124).

351 Tellenbach 1956a (12): » *Alles liegt in einer Linie, es sind keine Tiefenunterschiede mehr ... Alles ist wie eine feststehende Fläche* ».

352 Parnas, Møller, Kircher *et al* 2005.

353 Cutting 1999.

354 Minkowski 1970 (278).

355 Minkowski 1987 (194).

356 Brugger, Monsch & Johnson 1996; Sandson & Albert 1987.

357 Dimond 1979c (205).

358 Quoted in Werner 1957 (418).

359 Benjamin 1969 (84).

360 Quoted in Adorno 1944; from Kürnberger 1855 (372).

361 Jaspers 1963 (296).

362 Wiggins & Schwartz 2007.

363 Smolin 2013 (34).

364 Schwartz, Wiggins, Naudin *et al* 2005 (emphasis added).

365 Schreber 1955 (128 & 188).

366 Haslam 1810.

367 Møller & Husby 2000 (221: emphasis added).

368 Tatossian 2014a (95: emphasis added): « *Ce gigantesque tableau 'où tout ce que je pense s'inscrit en Noir sur Blanc ... aux yeux de l'Univers entier'* ».

369 I am indebted to Jan Zwicky for this observation.

370 Paumgarten (2014), on Aaron Chase: 'He glanced at the trail, looked again to his left, and saw a herd, maybe thirty elk, running at full tilt alongside his bike, like a pod of dolphins chasing a boat. After a moment, they rumbled past him and crossed the trail, neither he nor the elk slowing, dust kicking up and glowing in the early-evening sun, amid a thundering of hooves. It was a magical sight. The light was perfect ... Once the herd was gone, it was as though it'd never been there at all – Sasquatch, E.T., yeti. Pics or it didn't happen ... "It was hell," Chase says now. When the agony of

missing the shot trumps the joy of the experience worth shooting ... the purpose of the trip or trick is the record of it. Life is footage.'

371 Hooper 2016.

372 Goethe, *Faust I*, Act 1, sc 3.

373 Blake, 'Eternity'.

374 Bashō 1995 (233).

375 Soares & Storm 2018; Henkel 2013.

376 Binet 1894 (6).

377 *The Gentleman's Magazine*, June 1754 (252).

378 Minkowska 1925 (131: emphasis in original): « *Le professeur de gymnastique avait pris mes mensurations: et les mensurations des membres inférieurs n'avaient pas été prises, ce qui m'avait amené à penser que j'avais les membres inférieurs abîmés.* En réalité l'absence des mensurations des membres inférieurs entraînait dans ma pensée l'absence des membres inférieurs ».

379 Sass 2017 (124).

380 Autism and narrative comprehension: Nuske & Bavin 2011; Fletcher, Happé, Frith *et al* 1995; Eurelings-Bontekoe, Zwinkels, Schaap-Jonker *et al* 2011; autism and narrative generation: Bottema-Beutel & White 2016; Lee, Martin, Hogan *et al* 2018; Canfield, Eigsti, de Marchena *et al* 2016; Banney, Harper-Hill & Arnott 2015; King, Dockrell & Stuart 2014. Schizophrenia: Valentine & Robin 1950. See also: Allé, Gandolphe, Doba *et al* 2016; Sass 2017 (123–4).

381 Tatossian 2014a (45): « *je me suis sentie dédoublée* ».

382 Patient reported by Bin Kimura 1978 (p18), as in Fuchs 2013 (75: emphasis added).

383 See, especially, Derek Parfit (1984).

384 Kean 2009 (emphasis added).

385 See, eg, Humphrey 2006.

386 Stanghellini 2004 (154).

387 Kretschmer 1925 (152).

388 Sechehaye 1994 (44).

389 Sass & Pienkos 2015a.

390 For examples, see, eg, Robbins 2011 (188ff); Ey 1996 (180).

391 Deegan 2003 (369).

392 See Sass 2017 (esp 244–7); McGilchrist 2009b (esp 335 & 395).

393 Pascal 1976, §72 (Lafuma §199): « *Connaissons donc notre portée; nous sommes quelque chose, et ne sommes pas tout ; ce que nous avons d'être nous dérobe la connaissance des premiers principes, qui naissent du néant ; et le peu que nous avons d'être nous cache la vue de l'infini* ».

394 As reported by Hölderlin's friend Christoph Theodor Schwab; in Hölderlin 1923, vol 6 (444).

395 Kretschmer 1925 (245). Kretschmer's term 'schizothyme' is no longer in regular use.

CODA TO PART I

1 Leys 1977.

2 Sass & Byrom 2015.

3 Wapner, Hamby & Gardner 1981.

4 Gazzaniga 2011 (94).

5 Oleksiak, Postma, van der Ham *et al* 2011.

6 Suchan & Karnath 2011.

7 Wald 2015. See also Franklin, Drivonikou, Bevis *et al* 2008.

8 That is not to say that there are not so-called animal *models* of schizophrenia, but phenotypically they are far removed from the human condition and are identified by measuring distant proxies, such as startle reflexes, response inhibition, and so on.

9 Gazzaniga 1998.

10 Sacks 1986 (2–3).

10. WHAT IS TRUTH?

1 Agus 1941 (191). The phrase occurs in the context of an explication of the philosophy of Franz Rosenzweig (III.d: ‘Franz Rosenzweig: philosophy of religion’).

2 See Merleau-Ponty 1945 *passim* (esp 160).

3 Wordsworth, ‘Intimations of Immortality from Recollections of Early Childhood’.

4 Jugged hare is a traditional English country dish, involving marinating the hare in red wine with juniper berries, and cooking it slowly with some of the hare’s blood. In France it is known as *civet de lièvre*. Incidentally, the famous Mrs Beeton did not instruct the cook to ‘first catch your hare’, neither did her eighteenth-century predecessor, to whom the phrase has also been attributed (a better source of excellent recipes), Hannah Glasse.

5 Underhill 1914 (5–6: emphasis added).

6 Ricoeur 1973 (108).

7 Burke 1887, vol 1 (96).

8 Waley 1938, xii, §7 (164); cited by Onora O’Neill 2002 (3).

9 Waismann 1968 (98).

10 *ibid* (99).

11 Quinton 1966 (86).

12 See Waismann 1997 on the profound dis-analogy between philosophy and logic.

13 Haack 1976 (233).

14 Goodman 1994: ‘We can easily say that if we had to apply one of the labels – pragmatist or rationalist – to Wittgenstein’s early work and one to the later that the earlier work is rationalist and the later pragmatic.’

15 Passmore 1968 (428, n2).

16 Peirce 1877: ‘The person who confesses that there is such a thing as truth, which is distinguished from falsehood simply by this, that if acted on it will carry us to the point we aim at and not astray, and then, though convinced of this, dares not know the truth and seeks to avoid it, is in a sorry state of mind indeed.’

17 The philosopher Jonathan Rée on William James’s *The Varieties of Religious Experience*, speaking on BBC Radio 4’s programme *In Our Time*, 13 May 2010.

18 See, eg, Filipowicz, Anderson & Danckert 2016.

19 Schrödinger 1967a (127). Here in 1958 he refers to his own words six years earlier: ‘we never observe an object without its being modified or tinged by our own activity in observing it ... that mysterious boundary between the subject and the object *has broken down*’: Schrödinger 1951 (50–1: emphasis in original).

20 Hume 1896, Bk I, Pt IV, §7 (269).

21 Polányi 1958 (3).

22 Kruger & Dunning 1999; Ehrlinger, Johnson, Banner *et al* 2008.

23 Carse 2012 (3).

24 Zwicky 2014b, §102(a).

25 Deglin & Kinsbourne 1996.

26 There are several ways in which this can be achieved, nowadays most commonly using low-frequency TMS. This experiment was made possible by the existence of patients who were having the administration of electro-convulsive therapy (ECT) as part of their treatment programme: for 15–20 minutes after treatment, the hemisphere to which it has been applied is relatively unresponsive.

27 Chernigovskaya & Deglin 1986 (151: emphasis added).

SCIENCE & TRUTH

1 Tolstoy 2004 (275).

11. SCIENCE'S CLAIMS ON TRUTH

1 Whitehead 1929b (39).

2 Collingwood 1940 (40–1).

3 Ronchi 2014 (xx).

4 Ball 2011.

5 At least no source has been traced to my knowledge. It is usually cited as quoted by Richard Lewontin, but Lewontin doesn't give a source. It has also been repeatedly cited as from Rosenblueth & Wiener 1945, but I cannot find it there, either.

6 For a discussion of the fundamental role of metaphor in language, and particularly in that of science and philosophy, see Lakoff and Johnson 1980 & 1999; also McGilchrist 2009b (115ff).

7 Rosenblueth & Wiener 1945 (320–1).

8 Whitehead 1929b (8: emphasis added).

9 *ibid* (22).

10 Chargaff 1978 (56–7).

11 *ibid* (56).

12 One might want to make an exception of certain transient transcendent states, but arguably they are still experiences involving a human mind.

13 Planck 1932 (217). Similarly George Spencer-Brown says, 'We may take it that the world is undoubtedly itself (ie, is indistinct from itself), but, in any attempt to see itself, as an object, it must, equally undoubtedly act so as to make itself distinct from and therefore false to itself. In this condition, it will always partially elude itself.' And so with each one of us. He continues, 'In this sense, in respect to its own information, the universe *must* expand to escape the telescopes through which we, who are it, are trying to capture it, which is us' (Spencer-Brown 1969, 106: emphasis in original). This was rather wittily reconceived in a short poem by Gerald Grow: 'There's a kind of Uncertainty Principle / Of self-knowledge: / You can never really know yourself, / Because knowing yourself / Changes you' (Grow 2019).

14 James 1902 (320).

15 Chargaff 1978 (123).

16 Einstein, objecting to the placing of observables at the heart of the new quantum mechanics, during Heisenberg's 1926 lecture at Berlin; related by Heisenberg, and quoted in Salam 1990.

17 Hanson 1958 (19).

18 Goodman 2008.

19 Pross 2102 (146).

20 Gleiser 2014 (98–9).

21 Mill 1950 (105: emphasis added). In fact the same point had been made by Leibniz in a letter to Nicolas Rémond, dated 10 January 1714, in which he says: « *J'ay trouvé que la plupart des sectes [sc. philosophiques] ont raison dans une bonne partie de ce qu'elles avancent, mais non pas tant en ce qu'elles nient* » – 'I have found that the majority of [philosophical] sects are largely right in what they put forward, but not to the same extent in what they deny': Leibniz 1887 (607).

22 Whitehead 1954 (19; and *ibid* 276).

23 Whitehead 1929b (43).

24 McGilchrist 2009b (97 & 141–3).

25 Dewey 1931 (212).

26 Taleb 2013 (229 & 109).

27 The first part of this, » *Die Wissenschaft denkt nicht* «, is originally from page 4 of Heidegger's *Was heißt denken?*, the version of his lectures given in Freiburg in 1951–2 published by Max Niemeyer Verlag (1954), and later translated into English (1968). Heidegger then repeated it in a conversation with his pupil the German philosopher Richard Wisser on 17 September 1969, in which he follows it by another phrase in explanation, thus: » *Und dieser Satz: die Wissenschaft denkt nicht, der viel Aufsehen erregte, als ich ihn in einer Freiburger Vorlesung aussprach, bedeutet: Die Wissenschaft bewegt sich nicht in der Dimension der Philosophie. Sie ist aber, ohne daß sie es weiß, auf diese Dimension angewiesen* « [And this sentence 'Science doesn't think', which caused such a stir when I said it in a lecture in Freiburg, means: 'Science doesn't venture into the *realm of philosophy*', etc]. In Heidegger 2000, 702–710 (705: emphasis in original).

28 Aeschliman 1983 (20).

29 Maxwell 2004 (12).

30 Magee 1998a (218).

31 Einstein 1986 (75): » *Höchste Aufgabe des Physikers ist also das Aufsuchen jener allgemeinsten elementaren Gesetze, aus denen durch reine Deduktion das Weltbild zu gewinnen ist. Zu diesen elementaren Gesetzen führt kein logischer Weg, sondern nur die auf Einfühlung in die Erfahrung sich stützende Intuition.* «

32 Skyrms 1984. Skyrms mentions the term causation as indicating, variously: a sufficient condition for the effect; a necessary condition for the effect; a condition of statistical relevance to the effect; an explanation of the effect; a transfer of energy-momentum; the experimental 'manipulability' of effect by cause; and cause viewed as a 'primitive' physical relation. He then goes on to suggest that since the Einstein-Podolsky-Rosen paradox, these cannot be considered adequate, let alone exhaustive.

33 Boyer 1994 (132, n3).

34 Planck 1931b (58–9).

35 'Natural laws are not abstractions fixed once and for all, but sustained processes in which the character of law appears the more definitely the longer they are in operation' – commentary on 'The Great Treatise'; in *I Ching* 1968 (326). I am grateful to Stephen Lowy for bringing this to my notice.

36 Whitehead 1929b (41): 'The pathetic desire of mankind to find themselves starting from an intellectual basis which is clear, distinct, and certain, is illustrated by Newton's boast, *hypotheses non fingo*, at the same time when he enunciated his law of universal gravitation'.

37 Pross 2012 (48).

38 von Neumann 1955a (157).

39 Prigogine 1997 (7).

40 Simpson 1963 (82).

41 See, eg, Boyd 1991; and Salmon 1998.

42 Rozenblit & Keil 2002.

43 Medawar 1964 (43).

44 Sfard 1994.

45 Pauli 1957 (38: emphasis in original): » *Ich hoffe, daß niemand mehr der Meinung ist, daß Theorien durch zwingende logische Schlüsse aus Protokollbüchern abgeleitet werden, eine Ansicht,*

die in meinen Studententagen noch sehr in Mode war. Theorien kommen zustande durch ein vom empirischen Material inspiriertes Verstehen «.

[46](#) Medawar 1969 (29).

[47](#) Lakatos 1976 (10).

[48](#) All quoted in Lakatos *op cit* (10–11).

[49](#) Knorr 1980 (31).

[50](#) Hadamard 1945 (142–3).

[51](#) Schultz 1890.

[52](#) Strathern 2000.

[53](#) Halmos 1989 (87).

[54](#) von Helmholtz 1881.

[55](#) Kagan 2009 (33).

[56](#) Heisenberg 1971, “‘Understanding’ in modern physics’: 27–42 (38).

[57](#) Boyle 2010 (42).

[58](#) Meyers 2007 (261).

[59](#) Pasteur 1854.

[60](#) Bacon 1858a, Bk I, aphorisms III & X (47–8).

[61](#) Planck 1932 (214).

[62](#) Smolin 2008 (viii).

[63](#) *ibid* (xvi).

[64](#) *ibid* (xx).

[65](#) Greene 2005 (376).

[66](#) Smolin *op cit* (xxi).

[67](#) Schlosshauer, Kofler & Zeilinger 2013.

[68](#) Whitehead 1929a (xiv).

[69](#) Schrödinger 1996 (95).

[70](#) Russell 1961 (13–14).

[71](#) Levy 1974 (154).

[72](#) Berry 2000 (129). Cf Ortega y Gasset, who already in 1930 described a type of scientist ‘unparalleled in history. He is one who, out of all that has to be known in order to be a man of judgment, is only acquainted with one science, and even of that one only knows the small corner in which he is an active investigator. He even proclaims it as a virtue that he takes no cognisance of what lies outside the narrow territory specially cultivated by himself, and gives the name of “dilettantism” to any curiosity for the general scheme of knowledge’ (Ortega y Gasset 1994, 110).

12. THE SCIENCE OF LIFE: A STUDY IN LEFT HEMISPHERE CAPTURE

1 Leonardo, *Codex Trivulzianus* 2162, 36: ‘*Il moto è causa d’ogni vita*’.

2 Whitehead 1938 (207).

3 Leibniz 1714, §§71–2: « *Car tous les corps sont dans un flux perpétuel comme des rivières; et des parties y entrent et en sortent continuellement. Ainsi l’âme ne change de corps que peu à peu et par degrés, de sorte qu’elle n’est jamais dépouillée tout d’un coup de tous ses organes* » – ‘Thus the soul changes its body only little by little and by degrees, so that it is never deprived of all its organs at once.’

4 Heraclitus fr LII [Diels 84a, Marcovich 56A]. It is pleasingly apt in this context that the word translated as ‘changing’ here, μεταβάλλον, is from the same root as ‘metabolism’ – the process whereby, as I argue, living organisms remain the same by changing. Like many Heraclitean fragments we are reliant on a later writer, here Plotinus, quoting from memory, so it is possible to get too fastidious about translation; but the phrase μεταβάλλον ἀναπαύεται more literally means ‘by changing, it stands still’. However the idea seems to me clear, and is implicit in, and consonant with, Heraclitus’ pervasive antinomic ontology. It is also of interest that the seventh-century theologian Maximus the Confessor wrote: ‘When nature has come to exist in God through the essential unity of him in whom it was created, it will possess an *ever-moving stability* and a *stable and changeless form of movement* generated eternally round that which is one, unique and always the same. It has been said that this state is a direct and permanent grounding in the first cause of created beings’ (Maximus, ‘Various texts on theology, the divine economy, and virtue and vice: fifth century’: 1990–2020, vol 2, Part III, §48).

5 Dupré 2017b.

6 Hoffman 2016.

7 Simpson 1963 (83).

8 Woodger 1929 (246).

9 Bohm 1969.

10 von Bertalanffy 1933 (38).

11 Woese 2004 (185).

12 Norman Pace, Distinguished Professor of Molecular, Cellular and Developmental Biology at the University of Colorado, as reported in Buchanan 2010 (37).

13 Collins 2017.

14 Talbott 2010b (28).

15 Whitehead 1929a (84).

16 Adler & Tso 1974.

17 Horace, *Epistles*, x: ‘*Naturam expellas furca, tamen usque recurret*’.

18 Shapiro 2011 (7).

19 Talbott 2011c (25).

20 McClintock 1984 (794, 798 & 801: emphasis added).

- [21](#) Hartwell, Hood, Goldberg *et al* 2011 (3).
- [22](#) Danchin 2009 (3).
- [23](#) Dawkins 1976 (x).
- [24](#) Nicholson 2014.
- [25](#) Rosenberg 2005 (345).
- [26](#) Nicholson 2014.
- [27](#) Lewontin 2000 (xii–xiii).
- [28](#) Müller 1997 (2).
- [29](#) I am neither endorsing nor dismissing these claims about shared genomes, which are open to dispute.
- [30](#) Shapiro 2009.
- [31](#) Pennisi 2009.
- [32](#) Friz 1968. The precise figures should be treated with caution.
- [33](#) Shapiro 2013.
- [34](#) Burian 2005 (237).
- [35](#) Rothman 2002 (265).
- [36](#) Bray 2003; Schmucker, Clemens, Shu *et al* 2000.
- [37](#) See, eg, Jablonka & Lamb 2015.
- [38](#) Stotz & Griffiths 2004.
- [39](#) Pearson 2006.
- [40](#) Spilianakis, Lalioti, Town *et al* 2005.
- [41](#) Pearson 2006.
- [42](#) Nicholson 2014 (167).
- [43](#) Dupré 2005 (206).
- [44](#) Fijalkowska, Schaaper & Jonczyk 2012. See also: Schaaper 1993; and Kunkel 2004.
- [45](#) Noble 2017.
- [46](#) Levins & Lewontin 1985 (89).
- [47](#) Turner 2007 (134).
- [48](#) Fabris 2018 (246 & 250).
- [49](#) Burian 2005 (256).
- [50](#) Alberts, Johnson, Lewis *et al* 2008 (202).
- [51](#) Talbott 2010a (13–14).
- [52](#) Simonis, Klous, Splinter *et al* 2006.
- [53](#) Nicholson & Dupré 2018.
- [54](#) Nicholson 2018 (153).
- [55](#) Haldane 1940 (57).
- [56](#) Dupré & Nicholson 2018 (39).
- [57](#) Nicholson 2018 (153).

58 *ibid* (149). Cf Schelling 1799b (11: emphasis in original): ‘The chief problem in the philosophy of Nature is not to explain what is *active* in Nature (for that, being her primary condition, is easily understood), but rather that which is *static* and *permanent*. The explanation however lies within that very condition – that whatever is permanent is for Nature the limit-point of her activity. For, given this, Nature restlessly strives against every limitation’ – » *Das Hauptproblem der Naturphilosophie ist nicht, das Thätige in der Natur, (denn das ist ihr sehr begreiflich, weil es ihre erste Voraussetzung ist), sondern das Ruhende, Permanente zu erklären. Zu dieser Erklärung aber gelangt sie eben durch jene Voraussetzung, daß das Permanente für die Natur eine Schranke ihrer eignen Thätigkeit sey. Denn, wenn dies ist, so wird die rastlose Natur gegen jede Schranke ankämpfen* «.

59 Nicholson 2018 (148).

60 See Novalis 1967 (541): » *Daß unser Körper ein gebildeter Fluß ist, ist wohl nicht zu bezweifeln.* «

61 JS Haldane 1917 (90).

62 Vial de Saint-Bel, a famous veterinary surgeon and anatomist of the eighteenth century, proved mathematically from minute examination of the limb structure of a legendary racehorse, Eclipse, that he must have made certain movements with his legs which nobody could see. ‘Only when instantaneous photography was invented and applied to horse-racing, did these movements actually make their appearance in the photograph of a galloping horse’ (Cook 1902, 127–8).

63 Holdrege 2002 (12).

64 Bianconi, Piovesan, Facchin *et al* 2013.

65 Alberts, Johnson, Lewis *et al* 2008.

66 Stein 2004. See also Snider & Wolfenden 2000.

67 Berg, Tymoczko & Stryer 2002.

68 Talbott 2010b (32).

69 Levy, Landry & Michnick 2010.

70 Talbott 2010b (32–3).

71 Anjum & Mumford 2018 (63).

72 Dupré & Nicholson 2018 (15).

73 Dupré 2017b.

74 Stein 2004.

75 Shapiro 2013.

76 On the ‘stable’/‘static’ distinction in biology, see, eg, Dupré 2014 (15).

77 Dupré 2017a.

78 Birch 1988.

79 Dupré 2017a; Dupré & Nicholson 2018 (35).

80 Anjum & Mumford 2018 (65).

81 Gell 1984 (186).

82 Lewin 1984.

83 Gleiser 2014 (185).

84 Dumont, Pécasse & Maenhaut 2001 (I owe this example to Talbott 2010b).

85 Watts 1989 (30–1). This is something like Hume’s deconstruction of causation as mere repeatedly observed temporal propinquity.

- 86** Stein 2004.
- 87** Szent-Györgyi 1960; Pophristic & Goodman 2001; Yamamoto, Koashi, Ozdemir *et al*; Shi, Kumar & Lee 2017.
- 88** Bohm 1951: ‘The need for a nonmechanical description’, ch 8, §26 (167). The last two sentences follow on as a footnote at the base of the page.
- 89** Hankey 2015.
- 90** Ford 2017.
- 91** Schrödinger 1951 (53: emphasis in original).
- 92** Walsh 2018 (179).
- 93** Shapiro 2013.
- 94** Waddington 1953.
- 95** Beisson & Sonneborn 1965.
- 96** Nelsen, Frankel & Jenkins 1989.
- 97** Keller 2014 (40–1).
- 98** Dupré 2017b.
- 99** Mayer, Blinov & Loew 2009.
- 100** Dupré & Nicholson 2018 (20–1); Leclerc 1972.
- 101** Gibson 1979b (285). See also Gibson 1979a (127).
- 102** Walsh 2018 (174).
- 103** Sharma 2015 (66: emphases in original). I am grateful to John Saunders for bringing this book to my attention.
- 104** Dupré 2017a.
- 105** Sharma 2015 (67–9: emphasis in original).
- 106** Darwin 1887, vol III (159: emphasis added).
- 107** Nijhout 1990.
- 108** Sharma 2015 (2: emphasis in original).
- 109** Kumar & Takahashi 2010.
- 110** Yang 2010.
- 111** Greenman, Stephens, Smith *et al* 2007. For a general overview of tissue organisation field theory, see Baker 2015.
- 112** Lobry, Oh, Mansour *et al* 2014; Liu, Radisky, Yang *et al* 2012.
- 113** Huang, Ernberg & Kauffman 2009 (871: emphasis in original).
- 114** True & Haag 2001.
- 115** Verster, Ramani, McKay *et al* 2014.
- 116** Wang & Sommer 2011; Robinson 2011.
- 117** Salazar-Ciudad, Solé & Newman 2001.
- 118** Newman 2014.
- 119** Webster & Goodwin 2011 (87); and Nicholson 2014 (167).
- 120** Bray 2003. See also Schmucker, Clemens, Shu *et al* 2000.
- 121** Anjum & Mumford 2018 (64).

- [122](#) Dupré 2017b.
- [123](#) Guttinger 2018 (315ff).
- [124](#) Dunker, Lawson, Brown *et al* 2001; Uversky 2010; Gsponer & Babu 2009.
- [125](#) Verster, Ramani, McKay *et al* 2014.
- [126](#) Dupré & Nicholson 2018 (42).
- [127](#) Champagne, Weaver, Diorio *et al* 2006.
- [128](#) Chen, Bracht, Goldman *et al* 2014.
- [129](#) Walsh 2018 (179: emphasis added).
- [130](#) Noble 2017. The reference is to Dupré 2017a.
- [131](#) Shapiro 2013 (287).
- [132](#) Chen, Bracht, Goldman *et al* 2014.
- [133](#) Mackintosh & Schmidt 2010.
- [134](#) Weiss 1962 (3).
- [135](#) Dupré 2017a.
- [136](#) Taleb 2013.
- [137](#) Kauffman 1995 (26).
- [138](#) Talbott 2011a (7).
- [139](#) See, eg, Dupré & Nicholson 2018.
- [140](#) Turner 2007 (90).
- [141](#) ‘It is utterly impossible for human reason’, wrote Kant in *The Critique of Judgment*, ‘to hope to understand the generation even of a blade of grass from mere mechanical causes’(Kant 2007, 238; Part II, div 2, §77). An understanding relying on such causation is confuted, he believed, by the self-organising nature of Nature: ‘In such a natural product as this, every part is thought as owing its presence to the agency of all the remaining parts, and also as existing for the sake of the others and of the whole, that is as an instrument, or organ’ (*ibid*, 201; Part II, div 1, §65).
- [142](#) Walsh 2018 (172).
- [143](#) Batterman 2015 (133); quoted in Walsh *op cit* (172).
- [144](#) Bertolaso & Dupré 2018 (327).
- [145](#) Stein 2004.
- [146](#) Dumont & Prakash 2014.
- [147](#) Nicholson 2018 (147).
- [148](#) Woese 2004 (176). ‘Homoeorhesis’ is a term coined by Waddington in 1957 meaning steady *flow*, the processual equivalent of ‘homoeostasis’, which implies returning to a steady *state*.
- [149](#) Ford 2017.
- [150](#) Hoffmeyer 2008 (82).
- [151](#) JS Haldane 1917 (14: emphasis added).
- [152](#) For instance, Tseng & Levin (2013) report that ‘bioelectric cues function alongside chemical gradients, transcriptional networks, and haptic/tensile cues as part of the morphogenetic field that orchestrates individual cell behavior into large-scale anatomical pattern formation’. This is a rough description of the small part we observe to happen, but it doesn’t seem to me to get us closer to an explanation of what a morphogenetic field is, or where it is. I don’t have an answer, either, of course;

so my target is neither the positing of a morphogenetic field in the first place, which seems an intelligent hypothesis, nor the failure to provide an explanation of where or what it is, but rather the implication that one's favoured mechanism provides even a partial answer. See also Levin 2012; and Burr & Northrop 1935.

153 Ford 2017.

154 Birnbaum & Sánchez Alvarado 2008.

155 For further discussion, see Turner 2007 (79–87). See also Goss 1983 (esp 218–30); and Lincoln 1992.

156 Reddien & Sánchez Alvarado 2004.

157 E Darwin 1809 (419).

158 Handberg-Thorsager, Fernandez & Salo 2008.

159 Sarnat & Netsky 1985.

160 Buttarelli, Pellicano & Pontieri 2008.

161 Shomrat & Levin 2013. At least one group has been able to ‘demonstrate conclusively that associative memory survives metamorphosis in *Lepidoptera*’. What that implies is that, despite the dissolution of the caterpillar’s nervous system, memories that were imprinted in the caterpillar are nonetheless present in the imago (Blackiston, Silva Casey & Weiss 2008).

162 Voskoboynik, Simon-Blecher, Soen *et al* 2007.

163 Vandenberg, Adams & Levin 2012.

164 Levin 2012 (247).

165 McClintock 1984 (792).

166 Fabris 2018 (259).

167 Noble 2017 (emphasis in original).

168 Ford 2017.

169 Saigusa, Tero, Nakagaki *et al* 2008.

170 Ford *op cit*.

171 Hebb 1949 (70).

172 Spitzer 2017.

173 Weiss 1970.

174 Lewontin 1983.

175 Edwards 1993 (40: emphasis in original). There is a strong correlation between a bud’s closeness to the ideal form – whether measured by closest fit to the perfect mathematical curve-form, or simply as the mean of all examples – and the amount of sap in the bud, as an index of its vitality (203ff). Did the level of vitality dictate the form, or the form dictate the level of vitality? ‘We have here two possible ways of looking at the world. One sees form as a necessary adjunct of matter. The substance is there, therefore it must have a form of some sort or another. The form is there because of the substance. The other sees form as the primary reality, which can only then become visible to our eyes when it takes up substance and moulds it to its purpose. The substance is there because of the form’ (209). I imagine it could be both: an accident of form, due to say wind or weather, is therefore inhibited in vitality, which means that in turn it is less open to being moulded in the form to which it should go – and vice versa.

176 Weiss 1971.

[177](#) Webster & Goodwin 2011 (87 & 240); Leiserson, Bonini & Benzer 1994. I readily acknowledge that there are other mechanisms involved in the production of eyes, in which several genes interact (Iyer, Singh, Jensen *et al* 2018; McCammon, Blaker-Lee, Chen *et al* 2017). What remains of interest is that the whole senses that the parts need to change in order that a certain apparently foreseen outcome should be achieved for the whole, despite the normal mechanism's failure. Merely showing that a different mechanism comes into play does not address this issue.

[178](#) Barbaric, Miller & Dear 2007.

[179](#) Rassoulzadegan, Grandjean, Gounon *et al* 2006.

[180](#) Rechavi, Minevish & Hobert 2011.

[181](#) Foster 2000. I am indebted to Steve Taylor for this information.

[182](#) Talbott 2011b (44). See Caporale 2006, especially Doyle, Csete, & Caporale 2006. See also King & Kashi 2007; King 2011.

[183](#) Darwin 1859 (131).

[184](#) Jablonka & Lamb 2005 (80).

[185](#) Jack, Cruz, Hull *et al* 2015 (emphasis added).

[186](#) Cairns, Overbaugh & Miller 1988. See also Foster 1998; and Goodwin 1994.

[187](#) Taylor, Mulley, Dills *et al* 2015. The paper is cited by Noble (2017), who continues: 'Specifically, Taylor *et al* show that deletion of FleQ (Flagellar transcriptional regulator) in *Pseudomonas fluorescens*, and starvation of the bacteria, produces mutations that enable the regulatory role to be taken over by *a different pathway, normally involved in nitrogen uptake and assimilation. The genes required to produce flagella are then reactivated by the new regulatory pathway.* The authors interpret their work as showing how selection can rapidly produce this kind of substitution to restore activation of flagella genes. But, equally clearly, the mutations are targeted in a remarkably precise way. They are not randomly occurring anywhere in the genome' (emphasis added).

[188](#) Shapiro 2011 (143).

[189](#) *ibid* (146).

[190](#) Noble 2017.

[191](#) Darwin 1872 (421).

[192](#) Lipton 2005 (8).

[193](#) Driesch 1964. See fig 28.

[194](#) Goodwin 1994 (226).

[195](#) Lipton *op cit* (100).

[196](#) Dupré 2017b.

[197](#) Henning 2013 (240–1). See also Turner 2000.

[198](#) Dupré & Nicholson 2018 (27).

[199](#) *ibid* (25).

[200](#) Koonin 2016.

[201](#) Dupré 2010.

[202](#) Whitehead 1933 (290: emphasis added).

[203](#) Dupré & Nicholson 2018 (20).

[204](#) Arnellos 2018 (217).

205 Guttinger 2018 (309).

206 *ibid* (311).

207 Hallpike 2013. See more generally Tomasello 2009.

208 Dupré 2017a.

209 Lipton 2005 (14).

210 Quoted in Pennisi 2001.

211 Griffiths & Stotz 2018 (232), paraphrasing Oyama 2002.

212 Nicholson 2014. The paper provides a lucid and informative account of the history of the machine model in biology.

213 Hallpike 2013.

214 Petersen 1963.

215 Oliver 2019. A comment by philosopher of science Nancy Cartwright reflects her perception of a common structure to freedom in society and physics: ‘I imagine that natural objects are much like people in societies. Their behaviour is constrained by some specific laws and by a handful of general principles, but it is not determined in detail, even statistically. What happens on most occasions is dictated by no law at all’ Cartwright 1983 (49). For further discussion of determinism, in relation to matter and consciousness, see Chapter 25.

216 Bohm 1989.

217 von Bertalanffy 1933 (38).

218 In the introduction to J Scott Turner’s fascinating book *The Tinkerer’s Apprentice*, in which he dares to question the sufficiency of purely mechanical explanations, one senses his apprehension. Describing his book as not intentionally provocative, but nonetheless almost certain to irritate throughout, he writes: ‘The irritation culminates in the fourth stage, which is also the last chapter, where I bring the discussion back to what place design might have in a comprehensive theory of evolution. If you have not thrown the book against the wall already, perhaps this is the chapter that will make you do it’ (Turner 2007, 3). Is that the best he should be able to expect of his scientific colleagues? Would such a remark be expected in any other scientific context than the profoundly conservative life sciences?

219 One reason they may dislike such an attribution is that, that way, the ‘divine’ qualities are no longer available to be applied – in some cases, no doubt, unconsciously – to themselves. Some of it is quite explicit. The title of Mark Lynas’s popular book *The God Species* refers to ourselves.

220 Jonas 2001 (196).

221 Talbott 2010b (27).

222 Simpson 1963 (emphasis added).

223 Quoted in Mayr 1976 (392). A similar formulation is also attributed to the German physiologist Ernst Wilhelm von Brücke (see Cannon 1945, 108).

224 Mayr 1989 (55).

225 Monod 1977 (20). I cannot find a source for ‘nature does not have any intention or goal’. It is the quote from Monod most widely repeated across the internet: the sources are always unknown or non-existent. It may be a case of an unfounded ‘truth’ becoming ‘real’ through simple repetition. Claims are made (eg, on the Wikipedia page for Monod, though it gives no page reference and I suspect may not have been fully researched) that it might come from *Chance and Necessity*, a book I first read in my teens. However, I cannot find it there. Tellingly, it is not included, despite its currency, on Monod’s Wikiquote page. I welcome any hints from readers.

- 226** Conway Morris 2005. See also Parker, Tsagkogeorga, Cotton *et al* 2013.
- 227** Michelson 2013.
- 228** Dupré 2017a.
- 229** Woodger 1929 (432).
- 230** Stein 2004.
- 231** This is Conrad Hal Waddington's idea of 'chreodes', which I will return to in Chapter 27.
- 232** Weiss 1962.
- 233** Dobzhansky 1975. For an overview of this question, see Talbott 2011b: 'Organism-environment relations present us with so much complexity, so many possible parameters to track, that, apart from obviously disabling cases, there is no way to pronounce on *the* significance of a mutation for an organism, let alone for a population or for the future of the species ... If reduced fitness can be on the path toward higher fitness, and if the environment for which the organism is supposed to be fit is itself a modifier of the organism's fitness, then to what solid and stable ground do we anchor our idea of fitness?' Indeed biologists and philosophers, as Talbott points out, have yet to provide an adequate interpretation of fitness (Millstein & Skipper 2007); 'no concept in evolutionary biology has been more confusing' than that of fitness (Ariew & Lewontin 2004). 'Yet the neo-Darwinian theory of natural selection hinges, in its "status ... as empirical science," upon a reasonable understanding of what fitness means (Bouchard & Rosenberg 2004) ... Not only do we have great difficulty locating meaningless chance in the context of the actual life of organisms; it now turns out that the one outcome with respect to which randomness of mutation is supposed to obtain – namely, the organism's fitness – cannot be given any definite or agreed-upon meaning, let alone one that is testable' (Talbott *op cit*, 46–52).
- 234** Jacob 1977. Here again I am indebted to Stephen Talbott.
- 235** Kaessmann 2010.
- 236** Tautz & Domazet-Lošo 2011 (emphasis added).
- 237** Talbott *op cit* (52: emphasis in original).
- 238** Pfennig, Wund, Snell-Rood *et al* 2007.
- 239** Turner 2007 (224).
- 240** Ford 2017.
- 241** Beck 1975.
- 242** Ford *op cit*.
- 243** *ibid.*
- 244** *ibid.*
- 245** *ibid.*
- 246** Yong 2010.
- 247** Bonner 2010.
- 248** Nicolis, Zabzina, Latty *et al* 2011; Latty & Beekman 2011a.
- 249** Latty & Beekman 2011b; Beekman & Latty 2015.
- 250** Reid, Latty, Dussutour *et al* 2012.
- 251** Vogel & Dussutour 2016. See also Yong 2016.
- 252** Turner 2007 (226).

253 According to Thompson, it was first commented on (in the egg of a medusa) by Hermann Fol (1873, 476), the Swiss zoologist and father of modern cytology; then by at least six others that he names.

254 de la Mettrie 1996 (6).

255 Nicholson 2014.

256 *ibid.*

257 Dawkins 1986; Dennett 1995.

258 Dawkins 1998 (16).

259 Nicholson *op cit.*

260 Camazine, Deneubourg, Franks *et al* (2001: emphasis in original).

261 Turner 2007 (137).

262 Turner *op cit* (227).

263 Ford 2017.

264 *ibid.*

265 Nicholson 2018 (147). For a critique of servomechanisms as analogies to organic processes, see Oparin 1961; and Nicholson 2013.

266 Kapp 1954 (101).

267 Nicholson 2018 (147).

268 *ibid.* The reference is to de la Mettrie 1996 (6).

269 Liu 2016; Kawasaki 2002.

270 Mittelstrass 1988 (19).

271 Weyl 1950 (176).

272 Gare 2011 (67ff).

273 JS Haldane 1919 (125).

274 Prigogine 1997 (4).

275 Simons 2018 (53).

276 Stein 2004; see also Cobb 1988.

277 Simons *op cit* (53).

278 Bickhard 2009 (552–3: emphasis added). Amongst other sources, he cites Davies 1984; Sciama 1991; Aitchison 1985; Bickhard 2003; Huggett 2000; Cao 1999. For further discussion of these issues, see Chapters 24 and 25.

279 Dupré & Nicholson 2018 (15).

280 See further discussion in the light of the hemisphere hypothesis in Part III, esp Chapter 24.

281 Dupré *et al, op cit* (14).

282 von Bertalanffy 1952 (139).

283 Dupré 2017a.

284 I am told that in physics there is something called the Deborah number, which is an index of capacity for flow, it being observed that all solids flow under the right circumstances. Apparently the name is derived from the Biblical Song of Deborah, as recorded in Judges 5:5: ‘The mountains flowed before the Lord’. The name was chosen by materialist scientists Markus Reiner and Eugene Bingham (I am indebted to molecular biologist Dr Kenneth Kunz for this information).

- 285** Bruce 1973 (291).
- 286** Tong 2016.
- 287** See Bergson 1911a (8).
- 288** Bickhard 2009 (553).
- 289** Dupré 2017b.
- 290** Whitehead 1929a (4).
- 291** Robert Stetson Shaw; quoted in Gleick 1987 (262).
- 292** Woese 2004 (173).
- 293** Woese *op cit* (175).
- 294** Dr Alison Woollard, Royal Institution Christmas Lectures, 2013.
- 295** Pross 2012 (114–5).
- 296** Mermin 1990 (xi–xii).
- 297** Dupré & O’Malley 2009 (14). See also Wohlleben 2017.
- 298** Pross 2014.
- 299** Kaiser 2001.
- 300** Dupré *et al, op cit* (10).
- 301** *ibid* (11).
- 302** *ibid*. See also Cohn 1877; Shapiro 1998; Aguilar, Vlamakis, Losick *et al* 2007; Kolenbrander 2000; Lazazzera 2005; Fuqua, Winans & Greenberg 1994; Cho, Jönsson, Campbell *et al* 2007; and Crespi 2001.
- 303** Dupré *et al op cit*, further citing Segré & Lancet 2000.
- 304** Dupré *et al, op cit* (14).
- 305** *ibid* (emphasis added).
- 306** Smolin 2013 (xvii).
- 307** Bronowski 1958 (65).
- 308** Way, Collins, Keasling *et al* 2014.
- 309** Whitehead 1933 (159).
- 310** Haldane 1968 (2–3).

13. INSTITUTIONAL SCIENCE AND TRUTH

1 James 1909a (96).

2 Heinlein 1973 (248): ‘A human being should be able to change a diaper, plan an invasion, butcher a hog, conn a ship, design a building, write a sonnet, balance accounts, build a wall, set a bone, comfort the dying, take orders, give orders, cooperate, act alone, solve equations, analyze a new problem, pitch manure, program a computer, cook a tasty meal, fight efficiently, die gallantly. Specialization is for insects.’

3 Toynbee 1961 (130; 135, 633–4).

4 Wheeler 1979.

5 Eddy 1999.

6 Smolin 2008 (314).

7 Dewey 1984 (247).

8 Simpson 1963 (82).

9 Salk 1991.

10 Chargaff 1978 (55).

11 Chargaff *op cit* (56).

12 Chargaff *op cit* (113–4).

13 Chargaff *op cit* (114).

14 Chargaff *op cit* (119).

15 Chargaff *op cit* (55–6).

16 Hayes 1992. That this is not an inevitable concomitant of scientific thinking is evidenced by the fact that ‘for 125 years, between 1845 and 1970, the use of vocabulary in *Scientific American* was at or slightly below the level of a modern newspaper’; and ‘during *Nature*’s first 78 years (1869 to 1947) it was not necessary to be trained in science to read its contents because they were written near the 0.0 level [defined as the level of difficulty posed by an English-language newspaper]’. By 1990 *Nature*’s research papers had already reached 31.6, and presumably considerably higher by today.

17 *The Divided Brain* (film), Matter of Fact Media, 2018, at 1h:04min.

18 Salk 1991.

19 Nietzsche 1974a, §204 (trans RJ Hollingdale).

20 Eklund, Nichols & Knutsson 2016.

21 Slotnick 2017.

22 Seidenwurm & Devinsky 2006.

23 Cacioppo, Berntson, Lorig *et al* 2003; Henson 2005.

24 Goldberg 2001 (55).

25 Cacioppo, Berntson, Lorig *et al* 2003.

26 Wexler 1988 (68–71).

27 Parks, Loewenstein, Dodrill *et al* 1988; Haier, Siegel, Nuechterlein *et al* 1988; Carly, Golding & Hall 1995.

28 Yoshii, Barker, Chang *et al* 1988; Hatazawa, Brooks, di Chiro *et al* 1987; Haier, Chueh, Touchette *et al* 1995.

29 McDaniel 2005.

30 Seidenwurm & Devinsky 2006.

31 Interestingly for those who take the view, with which I disagree, that the right hemisphere is in some sense ‘female’, and the left hemisphere ‘male’, in those cases where the sexes tend to rely on different hemispheres, it is usually the right hemisphere that is activated in men, when the left hemisphere is activated in women; but, on principles I have already referred to, that too is open to interpretation.

32 Marinsek, Turner, Gazzaniga *et al* 2014. The term ‘imager’s fallacy’ appears to originate in Henson 2005 (216–7).

33 Jung-Beeman 2005; Giora, Fein, Laadan *et al* 2007.

34 Rorden & Karnath 2004.

35 Hughlings Jackson 1874; reprinted at 1915 (81).

36 Sergent 1994 (491). See also Harris 1999.

37 Price & Friston 2002a.

38 Stanislas Dehaene, quoted in Holt 2008 (44–5).

39 Aarts, Anderson, Anderson *et al* 2015.

40 Gilbert, King, Pettigrew *et al* 2016.

41 Anderson, Bahnik, Barnett-Cowan *et al* 2016.

42 Open Science Collaboration 2015.

43 Begley & Ellis 2012.

44 Baker 2016.

45 Available at go.nature.com/kbzs2b.

46 Henrion & Fischhoff 1986.

47 Munafò & Flint 2010.

48 Munafò, Stothart & Flint 2009.

49 Ioannidis 2005.

50 Button, Ioannidis, Mokrysz *et al* 2013.

51 Ioannidis *op cit*; and see Ioannadis & Trikalinos 2005.

52 Ioannidis *op cit*.

53 Lawrence 2007.

54 Martinson, Anderson & de Vries 2005.

55 John, Loewenstein & Prelec 2012.

56 Cookson 2012.

57 Tavaré 2012.

58 Smith 2006.

59 Vickers, Goyal, Harland *et al* 1998.

60 Lawrence 2007.

61 Brink 2013.

- 62** van der Wall 2012.
- 63** Lawrence 2007.
- 64** Rao & Andrade 2014.
- 65** Alberts 2013; see Rajagopal 2017.
- 66** Lawrence 2007; referring to Casal, Struhl & Lawrence 2002.
- 67** Simkin & Roychowdhury 2003.
- 68** Culumber, Bautista-Hernández, Monks *et al* 2014.
- 69** Seife 2014.
- 70** Mazières & Kohler 2014.
- 71** <http://blogs.nature.com/naturejobs/2017/06/26/sciences-fake-journal-epidemic/> (accessed 10 April 2021)
- 72** Beall 2017.
- 73** web.archive.org/web/20161222020349/https://scholarlyoa.com/publishers/ (accessed 10th April 2021)
- 74** web.archive.org/web/20170105195017/https://scholarlyoa.files.wordpress.com/2015/01/criteria-2015.pdf. (accessed 10 April 2021)
- 75** www.bartneck.de/2016/10/20/ios-just-got-a-paper-on-nuclear-physics-accepted-at-a-scientific-conference/ (accessed 10 April 2021)
- 76** Seife 2014.
- 77** Singal 2015.
- 78** Harris 2009.
- 79** Wise 2013.
- 80** Marcus & Oransky 2015.
- 81** Van Noorden 2014.
- 82** Bohannon 2013.
- 83** Ferguson, Marcus & Oransky 2014.
- 84** Callaway 2015.
- 85** Smith 2006.
- 86** Jefferson, Alderson, Wager *et al* 2002.
- 87** Smith *op cit*.
- 88** Annesley, Scott, Bastian *et al* 2017. See Csiszar 2016.
- 89** Cramer 1984.
- 90** Szilard 1961.
- 91** Steinhäuser, Adlassnig, Risch *et al* 2012. See also Horrobin 1990.
- 92** Auspitz 1983.
- 93** Godlee, Gale & Martyn 1998; Schroter, Black, Evans *et al* 2004.
- 94** Smith 2006.
- 95** *ibid*.
- 96** Okike, Hug, Kocher *et al* 2016.
- 97** Peters & Ceci 1982; see also Ceci & Peters 1982.

- 98** Ceci *et al*, *op cit*.
- 99** *ibid*.
- 100** *ibid*.
- 101** Stark-Adamec & Adamec 1981.
- 102** Ioannidis 2005.
- 103** Rennie 2003.
- 104** Lawrence 2007.
- 105** van Rooyen, Godlee, Evans *et al* 1999.
- 106** Lock 1985.
- 107** Hilgard & Jamieson 2017.
- 108** Olby 2003.
- 109** Dyson 1958.
- 110** history.aip.org/exhibits/rutherford/sections/alpha-particles-atom.html (accessed 10 April 2021).
- 111** Wu, Wang & Evans 2019.
- 112** Nielsen & Collison 2018.
- 113** Smolin 2008 (268–76).
- 114** Smolin *op cit* (xxii).
- 115** Hull 1990 (22).
- 116** Smolin *op cit* (264–7).
- 117** Power 1997.
- 118** Lawrence 2007.
- 119** See Brooks 2016 (location 2139). The exact date of Heisenberg’s discovery is not known.
- 120** Azoulay, Fons-Rosen & Graff Zivin 2015.
- 121** Planck 1948 (22); as at 1949 (33–4).
- 122** Geschwind 1984 (10: emphasis added).
- 123** *ibid*.
- 124** Liepmann 1900.
- 125** Goldstein 1908.
- 126** Kinnier Wilson & Walshe 1914. Geschwind states that this was in 1913, but I am unable to locate such a paper. Kinnier Wilson’s 1914 paper does report Goldstein’s of 1908; but, while it refers to three of Liepmann’s papers, it does not in fact include the relevant 1900 paper.
- 127** Geschwind *op cit* (12).
- 128** Kuhn 1962 (24).
- 129** Cardeña 2014.
- 130** Gray 1995.
- 131** Barber 1961 (598).
- 132** Schumacher 2017 (16ff).
- 133** www.bechly.at/ (accessed 6 March 2021).
- 134** dissentfromdarwin.org (accessed 10 April 2021).

135 Geschwind 1984 (10).

136 James 1897, ‘What psychical research has accomplished’: 299–327 (319–20 & 323–4).

137 Blake, ‘Infant sorrow’.

138 Taleb 2013.

139 Since the evidence presented in this book is not by any means the whole evidence I have considered, what I say should be taken as referring to the body of evidence presented in both *The Master and his Emissary* and in this present volume.

140 The phrase is usually quoted in the mediaeval Latin form: *Amicus Plato, sed magis amica veritas*. There is an approximation to this sentiment, which does not mention Plato by name, in Aristotle’s *Nicomachean Ethics* (1096a11–15), but the closest wording is to be found in the work of the thirteenth-century philosopher, Roger Bacon (*Opus majus*, I, v): ‘*Plato dicit, Amicus est Socrates, magister meus, sed magis est amica veritas. Et Aristotelis dicit se magis velle consentire veritati, quam amicitiae Platonis, doctoris nostri.*’

14. REASON'S CLAIMS ON TRUTH

- 1 Whitehead 1929b (28).
- 2 Zwicky 2014a, §58.
- 3 Pascal 1976, §253 (Lafuma §183): « 2 excès: exclure la raison, n'admettre que la raison ».
- 4 Heidegger 1975a (10).
- 5 Whitehead 1929b (51).
- 6 Whitehead 1929b (36).
- 7 Gellner 1975 (206–7: emphasis added).
- 8 Fish 2010.
- 9 Damasio 1994 (39).
- 10 Whitehead 2007 (6).
- 11 Rupert Read has recently argued forcefully for this second person perspective as the key to understanding Wittgenstein's philosophical endeavours (2021). See also Pinsent 2012 in relation to Aquinas.
- 12 Varela & Shear 1999.
- 13 Dewey 1931 (216).
- 14 Szilard 1972 (xix).
- 15 Wittgenstein 1975 (44: §341, §343).
- 16 Boswell 1953 (1308).
- 17 Plato, *Epistles*, VII, 341c (trans J Harward).
- 18 Plato, *Republic*, 394d (trans GMA Grube).
- 19 Plato, *Sophist*, 224e (trans HN Fowler). See also *Euthyphro*, 14c, where Plato affirms that 'the lover of inquiry must follow his beloved wherever it may lead him' (trans GMA Grube).
- 20 Kelly 2011.
- 21 Zwicky 2014a, §75.
- 22 Gare 2018.
- 23 Whitehead 1929b (60).
- 24 Hume 1896, Bk II, Pt III, §3 (415).
- 25 Quoted in Cytowic 1989, where it is attributed to Philip Golabuk. The original phrase comes from Golabuk's *Recovering From A Broken Heart* (1989) and is slightly different: 'Reasons are nothing more than the endless paperwork of the mind, which forever seeks evidence so that it can try cases' (Golabuk, personal communication).
- 26 Waismann 1968 (31–3: emphasis added).
- 27 Magee 1998b (40).
- 28 Waismann 1968 (21 & 23).
- 29 Nietzsche 1889, 'Das Problem des Sokrates': §4: » *die Superfötation des Logischen ... die ihn auszeichnet* «.

- 30** Cottingham 2009 (233–56); see also Cottingham 1998.
- 31** Waismann 1968 (29).
- 32** Mercier & Sperber 2011.
- 33** Burke 1887, vol 1 (97).
- 34** See, eg, Lord, Ross & Lepper 1979.
- 35** Hobbes 1841, vol 5, no 38, postscript (435); quoted in Cottingham 2014 (5).
- 36** Kim 2002.
- 37** Takemoto & Brinthaup 2017 (80). For further exploration of this topic, see also Hall 1973; Caudill & Weinstein 1969; Doi 1973; Haga & Haidt 1979.
- 38** Kim 2002.
- 39** Sundararajan & Raina 2015.
- 40** Whitehead 1929b (13–14).
- 41** Zwicky 2014a, §84. Nietzsche writes that we begin with our senses, but by the time the vampire of philosophy is finished feasting, all that is left is ‘mere bones, mere clatter ... categories, formulas, words’ (1974b §372, 333). The image lies deep in our consciousness, for a very good reason. I am grateful to Andrew Milne for drawing my attention to this connexion.
- 42** Dyson 2015 (243–4).
- 43** Cottingham 2009.
- 44** Schlegel 1991, §52: » *Es gibt eine eigne Gattung Menschen, bei denen die Begeistrung der Langenweile, die erste Regung der Philosophie ist* «.
- 45** Cottingham 2009.
- 46** *ibid.*
- 47** Schlegel 1991, §54 (trans P Firchow).
- 48** Earle 1960. The whole essay is a very rewarding read. Since it is, curiously, no longer available either in press or on the web, I have put it up on my main website: <https://channelmcgilchrist.com>.
- 49** Langford 1942 (323).
- 50** Cf Newman on analysis.
- 51** Levin 1999 (40).
- 52** Whitehead 1938 (87).
- 53** Cassirer 1977 (22).
- 54** Scheler 2009 (5).
- 55** ‘Knowledge as endarkenment’ is the title of a seminar given in 1980; see Nichol 2003 (261ff).
- 56** Merleau-Ponty 1964 (49). Cf Dōgen on enlightenment.
- 57** Bacon 1858a, Bk I, aphorisms III & X, 47–8; Heraclitus fr X [Diels 123, Marcovich 8] (trans C Kahn); Einstein, letter to Oswald Veblen, 30 April 1930: » *Die Natur verbirgt ihr Geheimnis durch die Erhabenheit ihres Wesens, aber nicht durch List* «: ‘it is not through guile, but through her essential sublimity, that Nature hides her secrets’; Heidegger 1975b (53).
- 58** Cottingham 2009. Cf the philosopher Hans Vaihinger 1935 (7): ‘The organic function of thought is carried on for the most part *unconsciously*. Should the product finally enter consciousness also, or should consciousness momentarily accompany the processes of logical thought, this light only penetrates to the shallows, and the actual fundamental processes are carried on in the darkness of the unconscious. The specifically purposeful operations are chiefly, and in any case at the beginning,

wholly instinctive and unconscious, even if they later press forward into the luminous circle of consciousness'. Cf also the philosopher Miguel Unamuno 1954 (2): 'In most of the histories of philosophy that I know, philosophic systems are presented to us as if growing out of one another spontaneously, and their authors, the philosophers, appear only as mere pretexts. The inner biography of the philosophers, of the men who philosophised, occupies only a secondary place. And yet it is precisely this inner biography that explains for us most things.'

59 Cottingham *op cit* (emphasis in original).

60 Eddington 1939 (129).

61 Leibniz 1999 (913): '[*Quo facto*] *quando orientur controversiae, non magis disputatione opus erit inter duos philosophos, quam inter duos Computistas. Sufficiet enim calamos in manus sumere sedereque ad abacos, et sibi mutuo (accito si placet amico) dicere: calculemus*'.

62 Pascal 1976, §253 (Lafuma §183): « 2 excès: exclure la raison, n'admettre que la raison ».

63 Heraclitus fr LXXX [Diels 54, Marcovich 9] (trans J Zwicky).

64 Newman 1998 (245–6).

65 *ibid* (259).

66 *ibid* (247).

67 *ibid* (254 & 256).

68 *ibid* (260).

69 *ibid* (253).

70 Hayek 2010 (154).

71 Fish 2010.

72 Pascal 1976, §267 (Lafuma §188): « *La dernière démarche de la raison est de reconnaître qu'il y a une infinité des choses qui la surpassent. Elle n'est que faible si elle ne va jusqu'à connaître cela* ».

73 Chaitin 2006.

74 *ibid* (emphasis added).

75 Pascal 1976, §272 (Lafuma §182): « *Il n'y a rien de si conforme à la raison que ce désaveu de la raison* ».

76 Cavell 1976 (325).

15. REASON'S PROGENY

- 1 Blake, *The Marriage of Heaven and Hell*, Plate 10, line 6.
- 2 Merleau-Ponty 1945 (196): « *l'équivoque est essentielle à l'existence humaine, et tout ce que nous vivons ou pensons a toujours plusieurs sens* ».
- 3 Dixon 2017.
- 4 The mathematician and economist Brian Arthur (2021) points out that algebra creates a world composed of nouns, not verbs; things, not processes.
- 5 Newell & Simon 1975.
- 6 Fromm 1960 (109: emphasis in original).
- 7 Nietzsche 2012 (11).
- 8 Fried 1981 (115).
- 9 Bergson 1912 (41).
- 10 Russell 1931 (86: emphasis added).
- 11 James 1911a (51: emphasis in original).
- 12 Kierkegaard 1971 (31).
- 13 James 1911b (247–8: emphasis in original).
- 14 See, eg, Johnson-Laird 1983.
- 15 Heisenberg 1974 (72).
- 16 Müller 1873 (11).
- 17 Berkeley 2009 (18).
- 18 Hume 1896, Bk I, Pt I, §7 (17).
- 19 Shibahara & Lucero-Wagoner 2002.
- 20 Papagno, Martello & Mattavelli 2013.
- 21 Papagno, Fogliata, Catricalà *et al* 2009.
- 22 Hirotani, Makuuchi, Rüschmeyer *et al* 2011; Kinno, Kawamura, Shioda *et al* 2008; Ye & Zhou 2009; Yokoyama, Miyamoto, Riera *et al* 2006; Yokoyama, Okamoto, Miyamoto *et al* 2006; Yokoyama, Watanabe, Iwata *et al* 2007.
- 23 Mack, Meltzer-Asscher, Barbieri *et al* 2013. Right inferior frontal activation has been found in previous studies that required participants to generate linguistic judgments about syntactic structures (Tettamanti, Rotondi, Perani *et al* 2009; Moro, Tettamanti, Perani *et al* 2001).
- 24 Just, Carpenter, Keller *et al* 1996; Xu, Kemeny, Park *et al* 2005.
- 25 Whitehead 1938 (168).
- 26 Nietzsche 2012 (11).
- 27 James 1902 (9). The reference is to the introduction to Part III of Spinoza's *Ethics*, 'On the origin and nature of the emotions'; Spinoza 1910 (84).
- 28 James 1911b: ch 13, 'Abstractionism and "Relativismus"' (249–50: emphasis in original).
- 29 Dewey 1931 (212).

- 30** Aristotle, *Nicomachean Ethics* V.10, §1137b12 (trans WD Ross).
- 31** Bergson 1911a (ix).
- 32** Nietzsche, ‘Congenital defect of philosophers’: 1994, §2 (14–15: emphasis in original).
- 33** Gellner 1975 (206).
- 34** See also Lakoff & Johnson 1980; Lakoff & Johnson 1999.
- 35** Lakoff & Johnson 1999 (4–5).
- 36** Kay 2011a (105).
- 37** Kay *op cit* (112).
- 38** Kay 2011b.
- 39** James 1943 (222–3).
- 40** Parfit 1984 (388).
- 41** Literally ‘thinkers by trade’. Hannah Arendt made the phrase famous by declaring ‘I have neither claim nor ambition to be a “philosopher” or be numbered among what Kant, not without irony, called *Denker von Gewerbe* (professional thinkers)’ (Arendt 1971, 3).
- 42** Cottingham 2009.
- 43** Dewey 1931 (219).
- 44** Quine 1970 (xi).
- 45** Cottingham 2009; Earle 1960.
- 46** Aristotle, *Nicomachean Ethics*, I.3, §1094b24 (trans WD Ross).
- 47** Aristotle, *Nicomachean Ethics*, V.10, §1137b29 (trans WD Ross). He compares the pliability of a humane rule to a mason’s rule made of lead, originating in the isle of Lesbos, which could be made to conform itself to the underlying stone.
- 48** Whitehead 1929b (62).
- 49** Burke 1887, vol 2 (39): ‘Speech on American Taxation’.
- 50** Burke 1887, vol 1 (137).
- 51** Pascal 1976, §1 (Lafuma §512): « *Ce qui fait donc que certains esprits fins ne sont pas géomètres, c’est qu’ils ne peuvent du tout se tourner vers les principes de Géométrie: mais ce qui fait que des géomètres ne sont pas fins, c’est qu’ils ne voient pas ce qui est devant eux, et qu’étant accoutumés aux principes nets et grossiers de Géométrie, et à ne raisonner qu’après avoir bien vu et manié leurs principes, ils se perdent dans les choses de finesse, où les principes ne se laissent pas ainsi manier. On les voit à peine: on les sent plutôt qu’on ne les voit: on a des peines infinies à les faire sentir à ceux qui ne les sentent pas d’eux-mêmes: ce sont choses tellement délicates et si nombreuses, qu’il faut un sens bien délicat et bien net pour les sentir, et sans pouvoir le plus souvent les démontrer par ordre comme en Géométrie, parce qu’on n’en possède pas ainsi les principes, et que ce serait une chose infinie de l’entreprendre. Il faut tout d’un coup voir la chose d’un seul regard, et non par progrès de raisonnement, au moins jusqu’à un certain degré. Et ainsi il est rare que les géomètres soient fins, et que les fins soient géomètres; à cause que les géomètres veulent traiter géométriquement les choses fines, et se rendent ridicules, voulant commencer par les définitions, et ensuite par les principes, ce qui n’est pas la manière d’agir en cette sorte de raisonnement. Ce n’est pas que l’esprit ne le fasse; mais il le fait tacitement, naturellement, et sans art; car l’expression en passe tous les hommes, et le sentiment n’en appartient qu’à peu* ».
- 52** Scruton 1997 (152).

- 53** Lévi-Strauss 1955 (138: emphasis added): « *l'œuvre du peintre, du poète ou du musicien, les mythes et les symboles du sauvage doivent nous apparaître, sinon comme une forme supérieure de connaissance, au moins comme la plus fondamentale, la seule véritablement commune, et dont la pensée scientifique constitue seulement la pointe acérée : plus pénétrante parce qu'aiguillée sur la pierre des faits, mais au prix d'une perte de substance ...* ».
- 54** Chiarello 1988; Chiarello, Burgess, Richards *et al* 1990.
- 55** Virtue, Haberman, Clancy *et al* 2006; Virtue, Parrish & Beeman 2008.
- 56** St George, Kutas, Martinez *et al* 1999.
- 57** Mashal, Faust, Hendler *et al* 2008.
- 58** Waismann 1968 (19 & 181).
- 59** Magee 1998a (60–1).
- 60** *The Spectator*, 27 February 1904 (325–6: author anonymous). I am grateful to Chief Justice James Allsop for bringing this to my attention.
- 61** Waismann 1968 (16).
- 62** The phrase appears to have been first used to describe the work of the Italian artist, Franco Grignani, whose posthumous 2016 show in Milan was entitled, *Il Rigore dell' Ambiguità*, though it has since been perpetuated by Nora Bateson (norabateson.wordpress.com/2017/05/), perhaps with more rigour, but of course no less ambiguity.
- 63** See helpful discussion in Aerts, Gabora & Sozzo 2013 (4).
- 64** Or at least pigeons and carp: see McGilchrist 2009b (108).
- 65** Huxley 1936a (240).
- 66** See McGilchrist *op cit* (304).
- 67** Duppa 1830 (25): 'Maxim LIII'. His entry in the DNB amusingly refers to him as 'the Platonic Duppa' (in the sexual sense); see Peach A, 'Richard Duppa', *Oxford Dictionary of National Biography*.
- 68** Kay 2011a (161).
- 69** Huxley 1936b (99).
- 70** Empson 1949 (6).
- 71** Letter of Keats to George and Thomas Keats, 21 December 1817 (1970, 43).
- 72** Braque 1952 (12): « *Il n'est en art qu'une chose qui vaille: celle que l'on ne peut expliquer.* »
- 73** Whitehead 1934 (72).
- 74** See McGilchrist 2009b (402).
- 75** Magee 1998a (96: emphasis in original). The first quotation is from AJ Ayer, and the remaining three are from John Searle.
- 76** An amusing example on the internet shows a clear sign on the door to a gym with the following ten words easily legible: 'Warning: Keep hands free and clear from all moving parts.' That was in the 1980s: by the 2000s it was replaced by a label of about 200 words in small type stretching over 10 paragraphs. <https://m.signalvnoise.com> (accessed 23 February 2021).
- 77** de Bonald 1857, II, title page, epigraph: « *Un peuple qui a perdu ses mœurs en voulant se donner des lois écrites, s'est imposé la dure nécessité de tout écrire, et même ses mœurs.* » (See 'Discours préliminaire', 111, where the wording is slightly different, and refers directly to the Revolution, though the meaning is substantially the same.)
- 78** Funnell, Colvin & Gazzaniga 2007.

- 79** Dehaene, Spelke, Pinel *et al* 1999. And see Chapter 4.
- 80** Stanescu-Cosson, Pinel, van de Moortele *et al* 2000.
- 81** Dehaene, Tzourio, Frak *et al* 1996; Kiefer & Dehaene 1997.
- 82** Mega, Gigerenzer & Volz 2015.
- 83** Cohen Kadosh, Bien & Sack 2012.
- 84** See McGilchrist 2009b (49).
- 85** <https://www.artsprofessional.co.uk/news/arts-council-impose-quantitative-measures-arts-quality> (accessed 6 March 2021).
- 86** Gill 1993 (emphasis added).
- 87** Chambers 1983 (53–4).
- 88** For an exploration of the qualities of these numbers in mythology, nature and music, see Schneider 1995.
- 89** Jung, ‘Synchronicity: an acausal connecting principle’: 1953–79, vol 8 (48–9).
- 90** The golden ratio, presenting no obvious mechanism for its explanation, has attracted sceptics as well as advocates, despite a history going back to Egypt, Greece and Rome. The most thorough and even-handed review I know is that by Christopher Green (Green 1995), in which he concludes: ‘I do not think it unreasonable to suggest that there has been a tendency among many psychologists to discount the golden section *a priori* as a “numerological fantasy”. I also think that it is clear, particularly in the tone of their writing, that doing away with this “fantasy” has been the guiding intent of many of them. Consequently, many of the studies have been carried out crudely, some even sloppily, rather than with a desire to “tease out” what might be a somewhat fragile, but nonetheless consistent, effect ... I am led to the judgment that the traditional aesthetic effects of the golden section may well be real, but that if they are, they are fragile as well. Repeated efforts to show them to be illusory have, in many instances, been followed up by efforts that have restored them, even when taking the latest round of criticism into account.’ For the ubiquity of ϕ in nature, see also a recent review by Iosa, Morone & Paolucci 2018. Also further discussion in Chapters 24 & 26.
- 91** Younger & Zongo 1989 (38).
- 92** Kay 2011a (164).
- 93** Scruton 2014 (628).
- 94** Waismann 1968 (30–1: emphasis added).
- 95** Peirce 1992 (29).
- 96** Young, Camprodon, Hauser *et al* 2010.
- 97** Marinsek, Turner, Gazzaniga *et al* 2014; Gazzaniga & Smylie 1984.
- 98** Roser, Fugelsang, Dunbar *et al* 2005; Wolford, Miller & Gazzaniga 2000.
- 99** Woods, Hamilton, Kranjec *et al* 2014.
- 100** Wende, Nagels, Blos *et al* 2013.
- 101** Kay 2011a.
- 102** Redmond & Taniguchi 2015.
- 103** Dreyfus & Dreyfus 1986.
- 104** Kay 2011a (121 & 147).
- 105** Mme de Sévigné, lettre du 14e mai 1686 au comte de Bussy-Rabutin: Sévigné 1846 (534): « *Il y a de certaines choses qu’on n’entend jamais, quand on ne les entend pas d’abord* ».

- 106** Needham 1954–98 (1956), vol 2 (85).
- 107** Elster 1983 (44).
- 108** Eliot, ‘Little Gidding: V’, *Four Quartets*.
- 109** Bergson 2007e (112).
- 110** Kline 1972–90, vol 1 (34).
- 111** Zwicky 2014b, §1.
- 112** Weyl 1995 (453).
- 113** Dyson 1956.
- 114** *ibid.*
- 115** Weyl *op cit* (453).
- 116** Weyl *op cit* (453, 454, 458 & 460: emphasis added).
- 117** Weyl *op cit* (650–1: emphasis added).
- 118** Hadamard 1945 (65).
- 119** Hadamard *op cit* (eg, 16 & 19).
- 120** Hadamard *op cit* (34).
- 121** Penrose 1994.
- 122** Zwicky 2014b, §61(a).
- 123** Kim 2002.
- 124** Alexander & Huggins 1964.
- 125** Bradley 1897 (xii).
- 126** Cornford 1912 (138), cited in Black 1983 (15). James’s friend and colleague FCS Schiller took a similar view: ‘Actually every philosophy was the offspring, the legitimate offspring, of an idiosyncrasy, and the history and psychology of its author had far more to do with its development than *der Gang der Sache selbst* [progression of the topic itself] ... The naïve student insists on viewing the system from the outside, as a logical structure, and not as a psychological process extending over a lifetime. And he thereby throws away, or loses, the key to understanding’ (Schiller 1933, 10–11).
- 127** Kay 2012. The quote from Franklin, which in the original runs ‘So convenient a thing it is to be a *reasonable creature*, since it enables one to find or make a reason for everything one has a mind to do’, comes from his *Autobiography* (1996, 27: emphasis in original).
- 128** Fichte 1970 (16).
- 129** Wang 2007.
- 130** James 1909a (263).
- 131** Dewey 1931 (215).
- 132** Wittgenstein 1984 (20e): ‘It is sometimes said that a man’s philosophy is a matter of temperament, and there is something in this. A preference for certain similes could be called a matter of temperament and it underlies far more disagreements than you might think’.
- 133** James 1960 (17–20): ‘The philosophy which is so important in each of us is not a technical matter; it is our more or less dumb sense of what life honestly means. It is only partly got from books; it is our individual way of just seeing and feeling the total push and pressure of the cosmos ... The history of philosophy is to a great extent that of a certain clash of human temperaments ... Of whatever temperament a professional philosopher is, he tries, when philosophising, to sink the fact of

his temperament. Temperament is no conventionally recognised reason, so he urges impersonal reasons only for his conclusions. Yet his temperament really gives him a stronger bias than any of his more strictly objective premises. It loads the evidence for him one way or the other ... There arises thus a certain insincerity in our philosophic discussions: the potentest of all our premises is never mentioned.'

134 Nietzsche 1994 §513 (238). Cf 'The statements of a speculative philosopher do not directly express facts about the universe but symptomatically express facts about himself: they form his unconscious autobiography' (Wisdom 1947, 177).

135 Nietzsche 1974a §6.

136 Murdoch 1999 (359).

137 Letter of Jung to Arnold Künzli, 28 February 1943; in Jung 1973–6, vol 1 (331–2).

138 Monk 2019. He points to the narrowness, pugnacity and cut and dried style of what I call the 'triple A' (Anglo-American analytic) tradition, headed up by Gilbert Ryle, its repudiation of context and neglect of the broader humanities; and wonders what would have happened if the broadly based, humane, style of Collingwood, Ryle's predecessor in the Waynflete chair at Oxford, had been allowed to flourish: 'Given just how different he was from Ryle – deeply cultured, curious about everything, eclectic in his interests – the question of what course post-war philosophy in Britain might have taken if Collingwood had not succumbed to a series of strokes at this relatively early age [early 50s] must rank as one of the great "what ifs" of intellectual history. Might British philosophy have avoided becoming as narrow as it at one time did, and might it have engaged much more fruitfully with continental thinking?'

139 Eslinger 1998; Gazzaniga, Ivry & Mangun 2008; Greene & Haidt 2002; Mendez & Shapira 2009; Koenigs, Young, Adolphs *et al* 2007; Anderson, Barrash & Bechara 2006; Martins, Faísca, Esteves *et al* 2012; Tranel, Bechara & Denburg 2002; Young, Cushman, Adolphs *et al* 2006; Mendez & Shapira 2009; Demaree, Everhart, Youngstorm *et al* 2005.

140 Sass 1994 (12).

141 Sass *op cit* (35).

142 Arendt 1971 (see 78–9 & 123).

143 See Chapter 9 above; and, eg, Parnas 2000; Sass 2003; Stanghellini 2004; Fuchs 2005.

144 Nietzsche 2003a, §481 (480: emphasis in original).

145 Scruton 1986 (vii).

146 Spinoza *Ethics*, IV, §44, dem: '*Amor est titillatio, concomitante idea causæ externæ*'.

147 Freud 2011 (15).

148 Freud 1933 (112).

149 Jones 1959 (60).

150 Ferenczi & Rank 1925 (40–1).

151 Attwood 2006 (120).

152 See, eg, Freudenreich 2007 (10).

153 Merleau-Ponty 1964 (155: emphasis in original).

154 Holbrook 1987 (esp 42–3); see also McGilchrist 2009b (332ff).

155 For Spinoza, see Fitzgerald 2001; for Kant, see Kretschmer 1925 (240); Fitzgerald 2005 (esp 109ff); for Bentham, see Lucas & Sheeran 2006; McGilchrist 2009b (339–40); Mill 2003 (52–87); for Russell, see James 2005 (97ff); Lyons & Fitzgerald 2006 (esp 290ff); for Ayer, see Rogers 1999; for Quine, see Fitzgerald 2005, 13; for Parfit, see Edmonds 2014, and *The Guardian* obituary, 2

January 2017, each of which irresistibly suggests the diagnosis (Parfit himself thought it might apply).

[156](#) For Pascal, see Weismann-Arcache 2010; and Weismann-Arcache & Tordjman 2012; for Hegel, see Pinkard 2001; for Kierkegaard, see Marino 2001; for Emerson, see Emerson 1960; for Nietzsche, see Cybulska 2000; for Peirce, see Brent 1998; for James, see Perry 1935; and for Dewey, see Martin 2003.

[157](#) Wolff 1995.

[158](#) Fitzgerald 2000 & 2004; Griswold 2007.

[159](#) Rhees 1984.

[160](#) Feyerabend 1975 (45 n).

[161](#) Minkowski 2002; Blankenburg 1971.

[162](#) Owen, Cutting & David 2007. And see Chapter 9.

[163](#) Sass 2017; Stanghellini 2004.

[164](#) Darwin 2002 (84–5).

[165](#) Letter of Darwin to TH Huxley, 9 July 1857; in Darwin 1903, vol I (98).

[166](#) As quoted in Petersen 1963 (9).

[167](#) Whitehead 1929a (5).

[168](#) Cobbett 1815.

[169](#) For discussion of this point, see McGilchrist 2009b (115ff); and Lakoff & Johnson 1999 *passim*.

[170](#) Locke 1849 (370): III, x, §34.

[171](#) MacIntyre 1988 (357–8: emphasis added).

[172](#) Wright 2014.

[173](#) Hofstadter & Dennett 1982 (343).

[174](#) Einstein 1921.

[175](#) Snell 1960 (213: emphasis added).

[176](#) Whitehead 1911 (61).

[177](#) Armstrong 2009 (2–4: emphasis in original).

[178](#) For an excellent survey of this progression, see Fowler 2011.

[179](#) Lincoln 1999 (10).

[180](#) Fowler *op cit*.

[181](#) *ibid*.

[182](#) Plato, *Republic* 2.337a; and eg, *Republic* 522a; *Cratylus* 408c, *Timaeus* 26c & 26e4.

[183](#) Plato, *Timaeus* 26e4; *Republic* 621b8; *Republic* 359d–360b; *Timaeus* 22c7; and *Republic* 514a–517a.

[184](#) Whitehead 1938 (68–9).

[185](#) Wittgenstein 1984 (24: emphasis in original): » *Philosophie dürfte man eigentlich nur dichten* «.

[186](#) Heidegger 1961 (329), rendered thus in Hoeller 1981.

[187](#) Whitehead 1938 (68).

[188](#) Nettl 1983.

[189](#) Production: Nottebohm 1970; reception: George, Vernier, Richard *et al* 2004.

190 Joseph Jordania (2006) provides many strands of evidence that human choral singing was the central feature of pre-linguistic communication (see also McGilchrist 2009b, Chapter 3); that human choral singing helped create the rhythmic flow of language; that choral singing was one of the main communication mediums for the social cohesion and bonding of early human communities, before the development of articulated speech; and that ‘after the change of the communication medium from singing into articulated speech, choral singing lost its direct survival value, has been gradually marginalized, and started disappearing over the centuries and millennia. Multiple examples of the gradual disappearance of traditions of polyphonic singing in different cultures support this supposition’ (14). Jordania also claims that ‘the universally accepted idea of the natural evolutionary transformation of monophonic singing into polyphonic singing is a fiction, totally unsupported by the evidence’ (209). Polyphony, he argues, is primary.

191 Jasmin, McGettigan, Agnew *et al* 2016.

192 Whitehead 1937 (178).

193 Whitehead 1933 (133).

194 Whitehead *op cit* (293).

195 Whitehead 1929a (11).

196 Whitehead 1933 (293).

197 See <http://www.ithkuil.net>; as well as http://library.conlang.org/articles/Ithkuil_Q_A.pdf.

198 Lévi-Strauss 1964 (20: emphasis in original). See also Lévi-Strauss 2001 (1): ‘You may remember that I have written that myths get thought in man unbeknownst to him. This has been much discussed and even criticised by my English-speaking colleagues, because their feeling is that, from an empirical point of view, it is an utterly meaningless sentence. But for me it describes a lived experience, because it says exactly how I perceive my own relationship to my work. That is, my work gets thought in me unbeknown to me.’ For what it is worth, I have precisely the same experience.

199 Lichtenberg 1967–72a (511), *Sudelbuch F*, §369: » *Die Metapher ist weit klüger als ihr Verfasser und so sind es viele Dinge. Alles hat seine Tiefen.* «

200 Peirce 1931–60, vol 5 (591).

201 Eckermann 1889–96, vol 6 (134–6), conversation of 6 May 1827: » *Die Deutschen sind übrigens wunderliche Leute! ... Da kommen sie und fragen, welche Idee ich in meinem ›Faust‹ zu verkörpern gesucht. Als ob ich das selber wüßte und aussprechen könnte! ... Vielmehr bin ich der Meinung: je incommensurabler und für den Verstand unfäßlicher eine poetische Production, desto besser.* «

202 Black 1962 (37).

203 Lakoff & Johnson 1999 (123 & 129).

204 Needham 1999 (vii).

205 Magee 1998a (98).

206 Zwicky 2014b, §30.

207 Eg, Foldi, Cicone & Gardner 1983; Kaplan, Brownell, Jacobs *et al* 1990; Heilman, Scholes & Watson 1975.

208 Richards 1965 (10–11).

209 Zwicky 2014b,c §45(a).

210 Lakoff & Johnson 1999 (289).

211 Letter of Coleridge to Thomas Poole, 16 October 1797; in Coleridge 1895, vol I (354).

212 Lewis 2014 (57).

213 Bateson 2000, 'Style, grace and information in primitive art': 128–52 (146).

214 Sass 1998.

215 *ibid.* The quotation is from Wittgenstein 1984 (40e).

216 Underhill 1914 (7).

217 Quoted in Reder & Schmidt 2010 (5).

218 Noë 2011.

219 Lewis 2014 (58).

220 *ibid* (emphasis in the original).

221 Lewis 2014 (57–8).

16. LOGICAL PARADOX: A FURTHER STUDY IN LEFT HEMISPHERE CAPTURE

- 1 Heidegger 1975a (8).
- 2 See opening of Part III.
- 3 HH Bohr 1967 (328).
- 4 Rescher 2001.
- 5 Kierkegaard 1985 (37).
- 6 Cuonzo 2014 (208).
- 7 Weiss 1952 (emphasis added).
- 8 Dowden undated.
- 9 Kierkegaard 1958 (89): entry for 17 May 1843.
- 10 In ancient Greek, what we call the ‘end’ of a rope was called ἀρχή, the ‘beginning’, implying the origination of a process: eg Herodotus, *The Histories*, Bk 4, §60.
- 11 Snell 1960 (244).
- 12 Melhuish 1973 (6).
- 13 Bergson 1911c (247–8: emphasis in original).
- 14 See, eg, Williamson 1994.
- 15 For a brief discussion of the Prisoner’s Dilemma, see McGilchrist 2009b (145–7). For an account and helpful exploration of the Prisoner’s Dilemma, see <https://plato.stanford.edu/entries/prisoner-dilemma/>. For further reading, see Poundstone 1992.
- 16 Minkowski 2004 (131).
- 17 Carroll 1895.
- 18 James 1909a, paraphrasing Hermann Lotze (55–6: emphasis in original).
- 19 Whitman, ‘Song of myself’.
- 20 Montaigne 1991 (704): Bk II, ch 16, ‘Of glory’.
- 21 Kenyon 1956. The ‘friend’ may have been the Swiss psychiatrist Carl Alfred Meier.
- 22 Makinson 1965.
- 23 Wittgenstein 1976b (206–7).
- 24 Plutarch, ‘Life of Theseus’, §22–3 (trans J Dryden).
- 25 Descartes 1984–91, vol 2: *Meditations on First Philosophy* (1–62), ‘Meditation III’ (33).
- 26 Descartes *op cit* (116 & 255): ‘Objections and Replies’, Author’s Replies to the Second Set of Objections, ‘Axioms or Common Notions’, Axiom II; and ‘Objections and Replies’, Author’s Replies to the Fifth Set of Objections, Objections to the Third Meditation, §9.
- 27 Descartes *op cit* (33, 116 & 255).
- 28 Parfit 1984.
- 29 Bergson 1920 (70). Cf Armstrong 2004 (109): ‘A flame is never constant; a fire which is lit at nightfall *both is and is not* the fire that is still burning at daybreak ... A person should be regarded as

a process, not an unchangeable entity’.

30 Thomson 1954.

31 Cuonzo 2014 (180).

32 Leibniz 1993 (67): ‘*Quam lubrica sit ratiocinatio circa infinita*’.

33 Leibniz *op cit* (63): ‘*Non ... posse prosiliri*’. See Knobloch 1999.

34 Galilei 1965, vol 8 (93): ‘*in un solo tratto*’; and see Knobloch *op cit*.

35 Hilbert 1984 (185).

36 Falletta 1985 (67–8).

37 Weyl 2010 (38: emphasis in original).

38 Quine 1951 (40).

39 de Broglie 1939 (217).

17. INTUITION'S CLAIMS ON TRUTH

- 1 Waismann 1968 (13).
- 2 James 1902 (73).
- 3 Schopenhauer 1974, vol 1 (469).
- 4 Bowers, Regehr, Balthazard *et al* 1990.
- 5 Ambady & Rosenthal 1992; Albright, Kenny & Malloy 1988; Funder & Colvin 1988; Watson 1989.
- 6 Rosenthal, Hall, Di Matteo *et al* 1979.
- 7 Wilson & Schooler 1991.
- 8 See, eg, Kelley & Jacoby 1990.
- 9 Unkelbach 2007; Winkielman, Schwarz & Belli 1998.
- 10 Engel, 'Institutions for intuitive man' in Engel & Singer 2008 (391). See also Glöckner 2007.
- 11 I am very grateful to Franck and Capucine Mourier for their generous willingness to share this story in print and answer with patience my many questions.
- 12 Struck 2016 (31–2).
- 13 Mittleman, Maclure, Sherwood *et al* 1995; Mostofsky, Maclure, Sherwood *et al* 2012. As an aside on the heart and mood, there is a well-known close connexion between cardiac disease and mood disorders, for a range of reasons; moreover, episodes of depression, mania, and anxiety are commoner after heart surgery than after non-cardiac surgery; and it is an odd but true observation that almost all antidepressants have what are described as 'side-effects' on the heart, but it is notable that efforts to produce anti-depressants that have no effect on the heart have resulted largely in medications that have in practice little effect on mood, either.
- 14 Schulz 2016. The meta-analysis 'revealed a complex network involving the posterior (granular) insula, the claustrum, as well as temporal and frontal areas, highlighting right-hemispheric dominance of cardioception'.
- 15 Furness, Callaghan, Rivera *et al* 2014; Roth & Dicke 2005.
- 16 Hadhazy 2010; quoting Emeran Mayer, Professor of Physiology, Psychiatry and Biobehavioral Sciences at the David Geffen School of Medicine at UCLA.
- 17 Struck 2016 (1–5).
- 18 James 1890, vol 2 (406).
- 19 Baumeister & Leary 1995.
- 20 Meltzoff & Moore 1983.
- 21 James *op cit* (393 & 441). On imitation in humans, see McGilchrist 2009b, Chapter 7.
- 22 Peirce 1931–60, vol 5 (591).
- 23 Yehuda, Daskalakis, Bierer *et al* 2015. An interesting twist is that the analysis revealed that both Holocaust survivors and their offspring show epigenetic changes at the same site of FKBP5 intron 7, but in the opposite direction: Holocaust survivors had 10% higher methylation than control parents, whereas Holocaust offspring had 7.7% *lower* methylation than control offspring. One possible

interpretation is that the effect may be to make offspring more resilient, rather than more vulnerable. But the clinical data are not sufficiently clear on this to be decisive.

24 Dias & Ressler 2014.

25 On transplant causing changes of personality, reports are no doubt at times attributable to the patient discovering a new lease of life following surgery, or are simply imagined, though there are a number of anecdotes of sudden dramatic changes in, for example, musical and food tastes towards those of the donor which are harder to explain. One study describes 10 striking cases in which there were changes in tastes in food, music, art, sexual, recreational, and career preferences in line with those of the donor, as well as specific instances of perceptions of names and sensory experiences related to the donors (Pearsall, Schwartz & Russek 2002). There are a number of possible mechanisms that have been proposed, including cellular memory, but there is always an explanatory gap in going from cell proteins to reliable changes of phenomenology (Liestner 2020). The topic does not lend itself to research because tastes are not measurable, and confidentiality means that patients often do not know the identity, let alone the characteristics, of the donor. However, I am told by staff at Papworth Hospital (home to the first successful heart transplant in the UK) that a senior surgeon there, who was experienced in heart transplant operations, ceased to operate after becoming unnerved by the personality changes in the recipients.

26 See, eg, Sheldrake 1995.

27 From Sheldrake's website: www.sheldrake.org/research/morphic-resonance.

28 Bohm 1952 (188).

29 For details, see Meijer & Geesink 2018.

30 Vincent 2012.

31 Deisboeck, Berens, Kansal *et al* 2001. See Levin 2012 for a full account.

32 Jung 1953–79, vol 8, §280.

33 Jung *op cit*, vol 9(i), §99.

34 Jung *op cit*, vol 6, §748.

35 Jung *op cit*, vol 8, §271.

36 Jung *op cit*, vol 9(i), §267.

37 Jung *op cit*, vol 8, §100.

38 Jung, 'Wotan' in *op cit*, vol 10, §395; originally in *Neue Schweizer Rundschau*, 1936, 3, 657–69.

39 Donald 2008 (192).

40 Johnson & Raab 2003.

41 Beilock, Bertenthal, McCoy *et al* 2004; Beilock, Carr, MacMahon *et al* 2002.

42 See, eg, Lane & Schooler 2004; Meissner & Brigham 2001; Melcher & Schooler 2004.

43 See, eg, Schooler, Ohlsson & Brooks 1993.

44 Schwartz 2005; Hammond, Hamm, Grassia *et al* 1987; Wilson & Schooler 1991.

45 Wilson, Hodge & LaFleur 1995; Wilson, Lisle, Schooler *et al* 1993; Wilson & Schooler 1991.

46 Betsch, Plessner, Schwioren *et al* 2001.

47 Bechara, Damasio, Tranel *et al* 1997. Interestingly, from an evolutionary psychology point of view, women take longer to work out the long-term advantageous deck in the IOWA GT: 'Our review suggests that women focus on both win-loss frequencies and long-term pay-off of decks, while men focus on long-term pay-off. Furthermore, women may be more sensitive to occasional losses in the long-term advantageous decks than men. As a consequence hereof, women need 40–60 trials in

addition before they reach the same level of performance as men' (van den Bos, Homberg & de Visser 2013). This is yet another indication that men tend to emphasise the bigger picture more than women.

[48](#) Bechara, Damasio, Tranel *et al* 1997.

[49](#) Turnbull, Worsey & Bowman 2007.

[50](#) Dunn, Galton, Morgan *et al* 2010.

[51](#) Miller, Giannini & Levine 1977.

[52](#) Valins 1967.

[53](#) Giannini, Daoood, Giannini *et al* 1978 (there was no sex difference, and no difference in handedness, in the overall results).

[54](#) Mobbs, Hassabis, Seymour *et al* 2009.

[55](#) See Epilogue.

[56](#) Stadler 1989.

[57](#) Reber 1967; Reber 1996.

[58](#) Fletcher, Zafiris, Frith *et al* 2005; Anagnostopoulos, Spiegel, Palmer *et al* 2013.

[59](#) Custers & Aarts 2011.

[60](#) Anagnostopoulos *et al*, *op cit*.

[61](#) Voss & Paller 2009.

[62](#) Zhaoping & Guyader 2007.

[63](#) Dijksterhuis & Meurs 2006; Usher, Russo, Weyers *et al* 2011.

[64](#) Segal 2004.

[65](#) Dijksterhuis, Bos, Nordgren *et al* 2006.

[66](#) Eg, Waroquier, Marchiori, Klein *et al* 2010. Although the authors seem to think that the decision, being concurrent with conscious information acquisition, must itself be conscious, this does not follow. Just because we are conscious of acquiring information doesn't mean we have to be conscious of the decision-making process going on at the same time – in fact, the opposite is more probable. (Oddly, those who hold this position also contrive to use the absence of any need for processing time as an argument in favour of conscious, rather than unconscious, processing.) The area is controversial; see, eg, González-Vallejo, Lassiter, Bellezza *et al* 2008. But much of the controversy here seems to me to hang on the unhelpful assumption that *either* decisions are made by information retrieved from long-term memory, *or* they are made at the very moment of information acquisition (so-called 'on-line'), our decisions being weighted by unconscious affective factors. These are not, however, mutually exclusive possibilities, and not even a true dichotomy. They may indeed be aspects of the same process which are each present to varying degrees in different situations; see, eg, Kim & Garrett 2012.

[67](#) Strick, Dijksterhuis & van Baaren 2010.

[68](#) Lerouge 2009.

[69](#) Betsch, Plessner, Schwieren *et al* 2001.

[70](#) See Joseph 1988; Joseph 1992; Hesselmann, Naccache, Cohen *et al* 2013.

[71](#) See Chapter 6.

[72](#) The term 'thin-slicing' comes from a paper I have cited above: Ambady & Rosenthal 1992. But the authors make clear that their view is that 'people rapidly and unwittingly communicate a great

deal of information regarding themselves to others’, in exposures of no more than fractions of a second (257: emphasis added).

73 Gladwell 2005 (91).

74 My thinking here has been influenced by the astute commentary of Lois Isenman (2013).

75 Miller 1956.

76 Stout, Busemeyer, Lin *et al* 2004; Weller, Levin, Shiv *et al* 2007; Fellows 2006. For a review, see Weber & Johnson 2009.

77 Fletcher, Zafiris, Frith *et al* 2005.

78 Grann 2010 (51–2).

79 Isenman 2013.

80 Christoff, Gordon, Smallwood *et al* 2009.

81 De Neys, Moyens & Vansteenwegen 2010.

82 Sheth, Sandkühler & Bhattacharya 2009.

83 Error detection in the posterior medial frontal cortex and anterior cingulate precedes error commission by 50–100 milliseconds: Maidhof 2013; Ruiz, Strübing, Jabusch *et al* 2011; Danielmeier, Eichele, Forstmann *et al* 2011; Bury, García-Huésca, Bhattacharya *et al* 2019. I am grateful to Jan Zwicky for bringing this phenomenon to my notice.

84 Willis & Todorov 2006.

85 Kay 2011a (148).

86 See, for example, Grandmaster Jonathan Rowson in *Chess for Zebras* (2005).

87 De Groot & Gobet 1996.

88 It is widely believed that there is no advantage at all for the chess professional in the random arrangement, based on earlier studies (Chase & Simon 1973), but this is now no longer thought to be the case (Gobet & Simon 1996).

89 www.youtube.com/watch?v=rWuJqCwfjjc

90 Goldstein & Gigerenzer 2002.

91 Shepard 1967.

92 Standing 1973. See also Standing, Conezio & Haber 1970.

93 Libet 1985; Soon, Brass, Heinze *et al* 2008. These experiments are discussed further in Chapter 25.

94 Claxton 1998 (217).

95 Bolte & Goschke 2005; Bowers, Regehr, Balthazard *et al* 1990. In case you were wondering, the answer here is SICK.

96 Pessoa, Japee & Ungerleider 2005. See Pessoa 2005 for an overview.

97 Andino, Menendez, Khateb *et al* 2009.

98 de Gelder, Tamiotto, van Boxtel *et al* 2008. The video clip at www.youtube.com/watch?v=GwGmWqX0MnM is worth watching.

99 Homer, *Iliad*, XV, lines 411–2.

100 Theocritus, *Idylls*, XV, line 83.

101 Walls, Hockberger & Gausche-Hill 2018 (xxii: emphasis in original): ‘The complex practice of medicine, vagaries of human diseases, unpredictability of pathologic conditions, and functions,

dysfunctions, and responses of the human body cannot be defined, explained, or rigidly categorised by any written document ... this text cannot replace physician judgement, cannot describe every possible aberration, nuance, clinical scenario, or presentation, and cannot define rigid standards for clinical actions or procedures. *Every medical encounter must be individualised, and every patient must be approached on a case-by-case basis.* No complex medical interaction can possibly be reduced to the written word.'

102 Lavell 2011.

103 Eg, Norman, Coblenz, Brooks *et al* 1992; Patel, Groen & Arocha 1990; Rikers, Schmidt, Boshuizen *et al* 2002.

104 Feltovich & Barrows 1984.

105 Custers, Boshuizen & Schmidt 1996; Custers, Boshuizen & Schmidt 1998; Hobus, Schmidt, Boshuizen *et al* 1987.

106 Bilalić, Kiesel, Pohl *et al* 2011.

107 Kundel, Nodine, Krupinski *et al* 2008.

108 Groopman 2007 (9).

109 Groopman *op cit* (5–6).

110 Carter, Milner, McGill *et al* 2017; Owens & Kelley 2017.

111 Quinlivan, Cooper, Meehan *et al* 2017.

112 Valentine & Gabbard 2014 (60); quoted in Schore 2014b.

113 Dreyfus & Dreyfus 1986.

114 Gilhooly, McGeorge, Hunter *et al* 1997; Schmidt & Boshuizen 1993.

115 Kundel & Nodine 1983.

116 Koedinger & Anderson 1990.

117 Elio & Scharf 1990.

118 Dreyfus & Dreyfus 1986 (40).

119 Guillaume, Jollant, Jaussent *et al* 2009; Heilman & Miclea 2015.

120 Dreyfus *et al*, *op cit* (121).

121 Benner undated.

122 Gobet & Chassy 2008.

123 *ibid*.

124 *ibid*.

125 King & Appleton 1997.

126 Pyles & Stern 1983; Young 1987.

127 Carper 1978; Pyles & Stern 1983; Rew 1986; McCormack 1993; McCutcheon & Pincombe 2001; Polge 1995.

128 King *et al*, *op cit*.

129 For a proponent of such a position, see English 1993.

130 Pyles & Stern 1983; Schraeder & Fischer 1987; Benner & Tanner 1987; Orme & Maggs 1993.

131 Schraeder & Fischer 1987 (49); Pyles & Stern 1983 (54); Benner & Tanner 1987.

132 King *et al*, *op cit*.

133 Schraeder & Fischer 1986 (161).

134 See McGilchrist 2009b (83).

135 Nietzsche 2011 (12: emphasis added): » *Der Leib ist eine große Vernunft, eine Vielheit mit Einem Sinne, ein Krieg und ein Frieden, eine Heerde und ein Hirt ... Es ist mehr Vernunft in deinem Leibe, als in deiner besten Weisheit.* «

18. THE UNTIMELY DEMISE OF INTUITION

- 1 Curry 2019 (40).
- 2 McGee & Foster, forthcoming.
- 3 Herbranson 2012.
- 4 Vazsonyi 1999.
- 5 Posner 1991.
- 6 Vazsonyi 1999.
- 7 Herbranson & Schroeder 2010.
- 8 Wolford, Miller & Gazzaniga 2000.
- 9 Wagoner 2017.
- 10 Hofstadter & Dennett 1982 (343).
- 11 Ostrom, Carpenter, Sedikides *et al* 1993.
- 12 Gadamer 1992 (272).
- 13 Barthold undated.
- 14 *ibid.*
- 15 Stanovich, West & Toplak 2013. See also, eg, Klaczynski & Lavalley 2005; Klaczynski & Robinson 2000; Stanovich & West 2007; Stanovich & West 2008.
- 16 Sá, Kelley, Ho *et al* 2005.
- 17 Henry & Napier 2017; Hochschild & Einstein 2016.
- 18 Kuppens & Spears 2014.
- 19 Majima 2015.
- 20 Kahan, Peters, Wittlin *et al* 2012. See also Kahan, Braman & Jenkins-Smith 2011 (149–50); Earle & Cvetkovich 1995; Siegrist, Cvetkovich & Roth 2000.
- 21 Asch 1951.
- 22 Asch 1956.
- 23 Petty & Cacioppo 1979.
- 24 Paxton, Ungar & Greene 2012.
- 25 Schwanberg 2010; Keysar, Hayakawa & An 2012; De Zulueta 1990; Lamendella 1977; Marcos 1976 & 1979; Rozensky & Gomez 1983.
- 26 Sedivy 2015.
- 27 Hallett, Chandler & Lalonde 2007.
- 28 Chandler, Lalonde, Sokol *et al* 2003 (3).
- 29 Scopelliti, Morewedge, McCormick *et al* 2015.
- 30 *ibid.*
- 31 West, Meserve & Stanovich 2012.
- 32 Jussim, Cain, Crawford *et al* 2010 (215).

- [33](#) List adapted from Ichheiser 1970.
- [34](#) Jussim, Crawford, Anglin *et al* 2016.
- [35](#) Richard, Bond, Stokes-Zoota 2003.
- [36](#) Jussim *et al*, *op cit*.
- [37](#) Chan, McCrae, De Fruyt *et al* 2012.
- [38](#) Swim 1994; Costa, Terracciano & McCrae 2001.
- [39](#) McCauley & Stitt 1978; see reviews by Ryan 2002 and Jussim 2012a.
- [40](#) Boster & Maltseva 2006; Terracciano & McCrae 2007.
- [41](#) Löckenhoff, Chan, McCrae *et al* 2014.
- [42](#) Costa, Terracciano & McCrae 2001.
- [43](#) McCrae, Chan, Jussim *et al* 2013.
- [44](#) Halpern, Straight & Stephenson 2011; Löckenhoff, Chan, McCrae *et al* 2014. See also Jussim, Crawford, Anglin *et al* 2016 (44 & 48).
- [45](#) Rettew, Billman & Davis 1993.
- [46](#) Kunda & Thagard 1996 (292).
- [47](#) Jussim, Crawford, Anglin *et al* 2016 (58).
- [48](#) Jussim 2012a (378).
- [49](#) Jussim *et al*, *op cit* (59).
- [50](#) Thomas 2007.
- [51](#) Thomas 2010.
- [52](#) Olivola, Funk & Todorov 2014; see also Todorov, Olivola & Funk 2015.
- [53](#) Bonnefon, Hopfensitz & De Neys 2015; Kovács-Bálint, Bereczkei & Hernádi 2013; Little, Jones, DeBruine *et al* 2013; Tognetti, Berticat, Raymond *et al* 2013.
- [54](#) Bonnefon, Hopfensitz & De Neys 2013.
- [55](#) De Neys, Hopfensitz & Bonnefon 2017.
- [56](#) De Neys, Hopfensitz & Bonnefon 2015.
- [57](#) Tognetti *et al*, *op cit*.
- [58](#) Kovács-Bálint, Bereczkei & Hernádi 2013.
- [59](#) Tskhay & Rule 2013. This reaches 99.2% for race: Remedios, Chasteen, Rule *et al* 2011 (1313).
- [60](#) Sylva, Rieger, Linsenmeier *et al* 2010.
- [61](#) Tskhay *et al*, *op cit*.
- [62](#) Quadflieg & Macrae 2011; Rivera, Arms-Chavez & Zárate 2009; Zárate, Stoevers, MacLin *et al* 2008.
- [63](#) Mitchell, Ames, Jenkins *et al* 2009.
- [64](#) Aron, Robbins & Poldrack 2004.
- [65](#) Koechlin, Ody & Kouneiher 2003; Aron 2007; Amodio 2014.
- [66](#) Amodio *op cit*.
- [67](#) Mercier & Sperber 2011 (emphasis added).
- [68](#) Kahneman 2012.

69 In relation to rationalising rather than correcting, the authors refer to a classic paper by Evans & Wason (1976).

70 Salk 1991.

71 Bergson 1912 (1).

72 Bergson 2007c (135; emphasis in original).

73 Leach & Weick 2018.

74 Weick 2017.

75 Perry 2017.

76 Kahneman 2012 (225).

77 Hoffman, Slovic & Rorer 1968.

78 Shanteau 1988. See also Bradley 1981; Oskamp 1965, cited by Shanteau *op cit*.

79 Brown 1983 (emphasis added).

80 Shanteau *op cit*.

81 Whitehead 1929b (52–3).

82 O'Mahony 2014: 'According to his son, Robert, Soros's trading was always influenced by more than reflexivity. "My father will sit down and give you theories to explain why he does this or that", he once said, "but I remember seeing it as a kid and thinking, 'Jesus Christ, at least half of this is bullshit'. I mean, you know the reason he changes his position on the market or whatever is because his back starts killing him. It has nothing to do with reason. He literally goes into a spasm and it's this early warning sign." Soros Snr has admitted to relying greatly on "animal instincts", saying the onset of acute pain was often "a signal that there was something wrong in my portfolio".'

83 Rikers, Schmidt, Boshuizen *et al* 2002.

84 Hobus, Schmidt, Boshuizen *et al* 1987.

85 Dane, Rockmann & Pratt 2012.

86 Tversky & Kahneman 1981.

87 Wason 1968.

88 Cosmides & Tooby 1992.

89 Moshman & Geil 1998.

90 Stafford 2014. See also Laughlin & Ellis 1986. The effect has been termed the 'assembly bonus effect' (Laughlin, Hatch, Silver *et al* 2006).

91 Mallon & Franks 2000; Mugford, Mallon & Franks 2001.

92 Gigerenzer 1991; Goldstein & Gigerenzer 2002.

93 Gigerenzer & Brighton 2009.

94 Kruglanski & Gigerenzer 2011.

95 Hertwig & Todd 2003; Hogarth & Karelaia 2005.

96 Eg, Bröder 2003.

97 Babylonian Talmud: Tractate Baba Mezi'a, folio 42a.

98 DeMiguel, Garlappi & Uppal 2009: 'We find that of the various optimizing models in the literature, there is no single model that consistently delivers a Sharpe ratio or a CEQ return that is higher than that of the 1/N portfolio, which also has a very low turnover.'

99 Gigerenzer 2008.

- 100** Hertwig & Todd 2003.
- 101** Reyna & Farley 2006. See also Dansereau, Knight & Flynn 2013; Strough, Karns & Schlosnagle 2011; Reyna 2008; Schlottmann & Tring 2005; Boyer 2006.
- 102** Morsanyi & Handley 2008.
- 103** Jostmann, Lakens & Schubert 2009.
- 104** See, eg, Bhalla & Proffitt 1999.
- 105** Kay 2011a (101).
- 106** Doherty, Campbell, Tsuji *et al* 2010; Kovács 2000: the Ebbinghaus illusion deceives adults but not children.
- 107** Silverstein, Keane, Wang *et al* 2013; Uhlhaas, Phillips, Mitchell *et al* 2006.
- 108** Herrmann, Zidansek, Sprott *et al* 2013; Teller & Dennis 2012; Madzharov, Block & Morrin 2015.
- 109** Eg: availability; the halo effect; prisoner's dilemmas; conformity; obedience; in-group effects; effect of rewards; misplaced consistency; correlation versus causation; conjunction fallacy; predicting the future; framing; estimating risk; face-to-face testimony versus dry data.
- 110** Usher, Russo, Weyers *et al* 2011.
- 111** Usher *et al, op cit*; Glöckner 2007; Glöckner & Betsch 2008a; Glöckner & Betsch 2008b.
- 112** Igou & Bless 2007.
- 113** Rader & Sloutsky 2002; Lea 1995; Lea, O'Brien, Fisch *et al* 1990; Leo & Greene 2008. See also De Neys, Moyens & Vansteenwegen 2010: the authors found that 'the presence of a clear autonomic conflict response during reasoning lends credence to the idea that reasoners have a "gut" feeling that signals that their intuitive response is not logically warranted'.
- 114** Handley, Newstead & Trippas 2011.
- 115** De Neys *et al, op cit*; Handley *et al, op cit*.
- 116** Morsanyi & Handley 2012.
- 117** See also Mega, Gigerenzer & Volz 2015; and Kruglanski & Gigerenzer 2011, which favours a single system view.
- 118** Wang 1986 (208–9).
- 119** Beck 1969 (426–7).
- 120** Kahneman: personal communication (21 November 2013).
- 121** Tsujii & Watanabe 2010.
- 122** Ellis 2015 (316–7).
- 123** Hume 1896, Bk II, Pt III, §8 (437).
- 124** Peirce, 'Detached ideas on vitally important topics': 1931–60, vol 1 (628).
- 125** Vauvenargues 1859, §154 (389): « *Les passions ont appris aux hommes la raison* ».
- 126** Gustafson 2005.
- 127** Dreyfus & Dreyfus 1986 (206).
- 128** Gobet & Chassy 2008; Dreyfus *et al, op cit* (147–8).
- 129** *ibid* (194–5).
- 130** *ibid* (200–1).
- 131** Rozenblit & Keil 2002.

132 Muller 2018 (23–4: emphasis added).

133 *ibid* (18–19, 20). See also Bevan & Hood 2006.

134 Muller *op cit* (20).

135 *ibid* (39–40).

136 Bevan *et al, op cit*.

137 See, eg, Sundararajan & Raina 2015.

138 Blankenburg 2001 (311).

139 Blankenburg 1969.

140 See, eg, Grover, Sahoo & Surendran 2018; Tonna, Ottoni, Paglia *et al* 2016. The preservation of common sense, on the other hand, differentiates affective disorders from schizophrenia: ‘in any case, the preserving of this ability in cyclothymic patients is an important criterion for differential diagnosis with schizophrenic patients’: Blankenburg 2001 (305). Blankenburg is arguing not that people with depression or mania always behave in common sense ways or that their beliefs are commonsensical – hardly. What he is suggesting is that the deep intuitive bridge to the shared world is preserved, even if temporarily lost sight of at the peaks of illness.

141 Blankenburg 2001 (307–8).

142 Blankenburg 2001 (310: emphasis in original).

143 Merleau-Ponty 1964 (155).

144 Rand, Greene & Nowak 2012.

145 Sri Aurobindo 1997 (114: emphasis added).

146 Minkowski 1970 (69).

147 Dreyfus & Dreyfus 1986 (81).

148 For discussion, see Chapter 26 below.

149 Whitehead 1911 (61).

19. INTUITION, IMAGINATION AND THE UNVEILING OF THE WORLD

1 Bergson 2007c (152). Elsewhere I have used Hulme's translation of the 1903 '*Introduction à la métaphysique*', as superior to Andison's; but here, unusually, she is closer than Hulme to the French: « *Nous ne saurions trop le répéter: de l'intuition on peut passer à l'analyse, mais non pas de l'analyse à l'intuition.* »

2 Feynman 1955.

3 Letter of Blake to the Revd Dr Trusler, 23 August 1799.

4 Kounios & Beeman 2014.

5 Einstein 1931 (97).

6 Suzuki 1969 (90).

7 Quoted in Einstein 1929 (17).

8 Sayen 1985 (26).

9 Wertheimer 1959 (213–28).

10 Einstein 1935.

11 Miller 1955.

12 Einstein 1986.

13 Gleiser 2014 (7).

14 Hadamard 1945, Einstein's reply to Hadamard's questions (143: emphasis added).

15 Dyson 1979 (62).

16 Kounios & Beeman 2014.

17 *ibid*, citing Sheehan 2008.

18 Caspar 1993 (63). I am indebted to Jan Zwicky for drawing my attention to this.

19 Wang 1986 (20: emphasis added).

20 Salvi, Bricolo, Bowden *et al* 2016.

21 Metcalfe 1986.

22 Sfard 1994.

23 Danek, Fraps, von Müller *et al* 2013.

24 Aristotle, *De arte poetica*, XXII.10, §1459a6–8 (trans WD Ross).

25 Hadamard *op cit* (31).

26 *ibid* (130).

27 Poincaré 1914 (59)/ cf 1913c (391).

28 Russell 1919 (60).

29 Dirac 1963.

30 Poincaré 1913b (210).

31 Sfard 1994.

- [32](#) Krutetskii 1976.
- [33](#) Shelley 1921 (56).
- [34](#) Grandin 2006.
- [35](#) Dissanayake 2018 (123).
- [36](#) Salvi, Bricolo, Franconeri *et al* 2015.
- [37](#) Velichkovsky, Krotkova, Sharaev *et al* 2017.
- [38](#) This is reflected in right occipital alpha activity (Ray & Cole 1985).
- [39](#) Luo, Niki & Knoblich 2006.
- [40](#) Jung-Beeman, Bowden, Haberman *et al* 2004.
- [41](#) Gilhooly & Fioratou 2009.
- [42](#) Schooler & Engstler-Schooler 1990.
- [43](#) Brandimonte, Hitch & Bishop 1992a; Brandimonte, Hitch & Bishop 1992b.
- [44](#) For a review, see Schooler, Fiore & Brandimonte 1997.
- [45](#) Wilson & Schooler 1991.
- [46](#) Sperry 1974a (12).
- [47](#) Sperry 1973 (215).
- [48](#) Mesulam 1969 (615).
- [49](#) Wagner, Gais, Haider *et al* 2004.
- [50](#) Pace-Schott, Nave, Morgan *et al* 2012.
- [51](#) Barrett 2011.
- [52](#) Karmanova 1982.
- [53](#) Casagrande & Bertini 2008. During the sleep onset period, all EEG bands, except beta, reverse, so as to predominate in the right hemisphere (Boldyreva & Zhavoronkova 1991; Zhavoronkova & Trofimova 1997, 1998). A right hemisphere superiority upon awakening from REM sleep has also been confirmed in behavioural studies, as well as evidence that the left hemisphere falls asleep first (see Gordon, Frooman & Lavie 1982; Bertini, Violani, Zoccolotti *et al* 1984; Casagrande, Violani, De Gennaro *et al* 1995). But the evidence on hemisphere predominance during dreaming, as such, is less clear-cut, with studies favouring either hemisphere, or neither.
- [54](#) Byron, as quoted in Trelawny 1858 (184).
- [55](#) Pushkin, *Evgeny Onegin*, Bk 8, §50 (trans GR Ledger).
- [56](#) Shelley 1921 (53–4: emphasis added).
- [57](#) Letter of Blake to the Revd Dr Trusler, 16 August 1799.
- [58](#) Bashō 1995 (234).
- [59](#) ‘It thinks in me, thinking goes on in me, is the pure fact, in the same way as I can say with equal justification: “I dreamed”, and “it dreamed in me”’: Schelling 1994 (48).
- [60](#) Thackeray 1879 (229).
- [61](#) Letter of Dickens to John Forster, dated (?) October 1841; in Dickens 2012 (90).
- [62](#) Cf Pullman 2017, 205–37 (227): ‘inspiration ... feels like *discovery*, not *invention*. It feels as if the story I’m writing already exists, in some Platonic way, and that I’m privileged from time to time to gain access to it’.
- [63](#) See McGilchrist 2009b (304).

64 Wordsworth, 'Lines composed a few miles above Tintern Abbey, on revisiting the banks of the Wye during a tour, July 13, 1798'.

65 Waismann 1968 (204–5: emphasis in original).

66 Bergson 2007d (89–90).

67 Emerson 1854 (40).

68 Lawrence 2005 (109).

69 For a useful discussion of the German origins of Coleridge's thought, see the edition of *Biographia Literaria* in Coleridge 1985, esp the Editors' Introduction (xli–cxxxvi), and notes to 168–70.

70 James 1943 (222–3). This is, of course, absolutely not to say that we should trust only the evidence of our senses. 'The man who cannot believe his senses, and the man who cannot believe anything else, are both insane, but their insanity is proved not by any error in their argument, but by the manifest mistake of their whole lives' (Chesterton 1909, 45).

71 Pessoa, Thompson & Noë 1998 (746 & 793).

72 Seeing is 'an active process of probing the external environment as though it were a continuously available external memory' (O'Regan 1992, 484); see also Pessoa, Thompson & Noë 1998. Even within the realm of one sensory modality the connexions are extraordinarily rich, profuse and interactive (Zeki & Shipp 1988).

73 Summerfield & de Lange 2014; Kok, Jehee & de Lange 2012; Rahnev, Lau & de Lange 2011; Hohwy 2014.

74 James 1890, vol 2 (103).

75 Wordsworth, *The Prelude* (1805), Bk VII, lines 655–7.

76 Coleridge 1817. All allusions and reference in this paragraph are from vol I, 295–6, & vol II, 12.

77 Coleridge 1817. All allusions in this paragraph are from vol II, 12.

78 Coleridge 1817, vol I (295–6: emphasis in original).

79 Coleridge 1962, §3158. In this entry Coleridge gives a trenchant rebuttal of philosophy in the absence of imagination: 'Form is factitious *Being*, and Thinking is the Process. Imagination the Laboratory, in which Thought elaborates Essence into Existence. A Psilosopher [*sic*], i.e. a nominal Ph. without Imagination, is a Coiner—Vanity, the *Froth* of the molten Mass, is his *Stuff*—and Verbiage the Stamp & Impression. This is but a *deaf* Metaphor—better say, that he is guilty of Forgery—he presents the same (sort of) *Paper* as the honest Barterer, but when you carry it to the *Bank*, it is found to be drawn on—Outis, *Esqre*. His Words had deposited no Forms there, payable at Sight—or even at any imaginable Time from the Date of the Draft/'. Outis (Οὔτις) is Greek for 'nobody'.

80 Coleridge 1985: notes to 168–69.

81 Coleridge 1817, vol II (11–12).

82 Coleridge 1817, vol II (6).

83 'With what must science begin?' in Hegel 1969, vol I, Bk I, §112: » ...[*die*] *Einheit des Unterschieden- und des Nichtunterschiedenseyns, – oder [die] Identität der Identität und Nichtidentität.* «

84 Schelling 1830 (98): » *Ohne intellektuelle Anschauung keine Philosophie!* «

85 Gare 2011.

86 Bergson 2007c (160).

87 Bergson 2007b (24).

88 The root is *g'n: cf Greek γινώσκειν/γίγνεσθαι. See Ronchi 2014 (xv). Ernout & Meillet 2001 (446): *Cognoscere: la racine signifiant « connaître » est, en indo-européen, homonyme de celle signifiant « naître, engendrer »*. This is a disputed area, and I cannot claim expertise here.

89 Quoted in Buhner 2014, epigraph to Chapter 2 (thanks to Nicholas Colloff).

90 Chargaff 1978 (109).

91 Coleridge 1957, §383 & §1016.

92 Chargaff *op cit* (111–2). Cf Thoreau's reported observation that candlelight illuminates darkness, while electricity kills it.

93 Feynman 1992 (127–8).

CODA TO PART II

1 The reader may remember that the right hemisphere is better at internal visualisation during the insight phase of a creative task. This not in any way in conflict with its generally being more attentive to and perceptive of the external world, as explained at length in Part I of this book.

2 Donne, 'Satyre III'.

APPENDIX 1

1 Some techniques may offer help in localisation (see, eg, Spyrou & Sanei 2008), but generally ERPs are highly reliable for temporal, but highly unreliable for spatial, localisation.

2 Woodman 2010: for further insights into these problems see Luck 2005; and Handy 2004.

3 Dan'ko, Starchenko & Bechtereva 2003; Kounios, Frymiare, Bowden *et al* 2006; Lang, Kanngieser, Jaśkowski 2006; Lavric, Forstmeier & Rippon 2000; Mai, Luo, Wu *et al* 2004; Qiu, Li, Yang *et al* 2008; Qiu, Li, Jou (not Yang D, as cited by Dietrich & Kanso) 2008.

4 Razumnikova 2005.

5 Bazanova & Aftanas 2008 (NB 38(3), not 42(3) as cited by Dietrich & Kanso); Dan'ko, Shemyakina, Nagornova *et al* 2009; Shemyakina & Dan'ko 2007; Fink & Neubauer 2006; Jaušovec & Jaušovec 2000b; Jin, Kwon, Jeong *et al* 2006; Martindale & Hines 1975 (NB 91–100, not 71–80, as cited by Dietrich & Kanso); and Mölle, Marshall, Wolf *et al* 1999.

6 Razumnikova 2007.

7 See, eg, Bowden & Beeman 1998; St George, Kutas, Martinez *et al* 1999; Jung-Beeman 2005; Kounios & Beeman 2014.

8 Fink & Neubauer 2006.

9 Razumnikova, Volf & Tarasova 2009. One could also cite on this topic: Razumnikova 2004b; Hoppe and Kyle 1990; O'Boyle, Benbow & Alexander 1995; Bowden, Jung-Beeman, Fleck J *et al* 2005; Howard-Jones, Blakemore, Samuel *et al* 2005.

10 Fink, Grabner, Benedek *et al* 2006.

11 Jaušovec 2000.

12 Jaušovec & Jaušovec 2000a.

13 Razumnikova 2000. Importantly this researcher, who is also the only one to find creativity more linked to the left hemisphere, oddly found that '*convergent* thinking induced coherence increases ... that were more caudal [posterior] and right-sided'.

14 Fink, Graif & Neubauer 2009.

15 Martindale, Hines, Mitchell *et al* 1984.

16 Razumnikova 2004a.

17 Grabner, Fink & Neubauer 2007.

18 Fink, Grabner, Benedek *et al* 2009. I am most grateful to Andreas Fink for his clarification on this point. The abstract, which runs to almost 200 words, mentions the left hemisphere, but has nothing whatever to say about the right. Considering the clarity and significance of the finding about the right hemisphere and originality in a paper entitled 'The creative brain', I wondered for a moment if I had misunderstood the data, and so emailed the first author, Andreas Fink. He very graciously, and promptly, responded that I was 'perfectly right, more highly original subjects showed stronger alpha power increases at right posterior cortical sites (centrotemporal to parietooccipital)', and that they had commented 'briefly' on the matter in the body of their paper – as indeed they had.

19 Martindale & Hasenpus 1978.

20 Seger, Desmond, Glover *et al* 2000.

21 Krug, Mölle, Dodt *et al* 2003 (emphasis added).

22 Fink, Grabner, Benedek *et al* 2009.

23 'It is important to recognize that the term EEG "resting state" is a state where a high level of neural network dynamics are continuously ongoing, in which the readiness or "potential" to allocate neural resource is continuously present': Thatcher, North & Biver 2005 (2139).

24 See, eg, Jensen, Gelfand, Kounios *et al* 2002; and Sauseng, Klimesch, Doppelmayr *et al* 2005.

25 For a review, see Benedek, Bergner, Könen *et al* 2011. Other evidence on the paradox of the facilitatory nature of apparently 'inhibitory' alpha: Klimesch, Sauseng & Hanslmayr 2007; Klimesch, Doppelmayr, Röhms *et al* 2000; Klimesch, Doppelmayr, Schwaiger *et al* 1999; and Cooper, Croft, Dominey *et al* 2003.

26 Lustenberger, Boyle, Foulser *et al* 2015; Fink, Benedek, Grabner *et al* 2007. For a review, see: Arden, Chavez, Grazioplene *et al* 2010.

27 Benedek, Bergner, Könen *et al* 2011.

28 For an admirably clear exposition of the issues involved see Hagemann, Naumann & Thayer 2001.

29 Folley & Park 2005.

30 Kiefer, Weisbrod, Kern *et al* 1998; Seger, Desmond, Glover *et al* 2000.

31 Atchley, Keeney & Burgess 1999; Bekhtereva, Starchenko, Klyucharev *et al* 2000; Carlsson, Wendt & Risberg 2000.

32 Bowden & Beeman 2003; Jung-Beeman, Bowden, Haberman *et al* 2004; Martindale, Hines, Mitchell *et al* 1984; Miller & Tippett 1996; Razumnikova 2004a.

33 On that point, as a side issue, after 'quantitative assessment' of the way in which 405 people solved problems, Carol Aldous proposed that creative thinking involved three processes: the interaction between visual-spatial and analytical-verbal reasoning; the interaction between conscious and non-conscious reasoning; and listening to the 'self' (CR Aldous 2007). What these may all indicate is permitting the right hemisphere to be heard. Normally analytical-verbal reasoning overshadows visual-spatial reasoning, and conscious processes overshadow unconscious ones; so 'interaction' might simply amount to not having a conscious, analytical-verbal monopoly, which is what effectively happens when the left hemisphere is 'in charge'. And listening to the 'self' boils down to attending to intuition, which is very largely right hemisphere-dependent, as we will see in Chapter 17.

34 Howard-Jones, Blakemore, Samuel *et al* 2005 (emphasis added).

35 See, for example, Beeman 1998; Beeman, Friedman, Grafman *et al* 1994.

36 Hansen, Azzopardi, Matthews *et al* 2008.

37 Blom, Cervenka, Karabanov 2008.

38 Jung, Segall, Bockholt *et al* 2010 (NB not 2009, as cited by Dietrich & Kanso).

39 Moore, Bhadelia, Billings *et al* 2009. The authors comment: 'Although these results were not predicted, perhaps, as suggested by Bogen and Bogen (1988), decreased callosal connectivity enhances hemispheric specialization, which benefits the incubation of ideas that are critical for the divergent-thinking component of creativity, and it is the momentary inhibition of this hemispheric independence that accounts for the illumination that is part of the innovative stage of creativity.'

40 Hori, Nagamine, Soshi *et al* 2008.

41 Goel & Vartanian 2005. See also Vartanian & Goel 2005.

42 Sieborger, Ferstl & von Cramon 2007.

43 Gibson, Folley & Park 2009.

44 Chávez-Eakle, Graf-Guerrero, García-Reyna *et al* 2007.

45 Chávez, Graff-Guerrero, García-Reyna *et al* 2004.

46 Carlsson, Wendt & Risberg 2000.

47 Villarreal, Cerquetti, Caruso *et al* 2013.

48 RE Jung, Gasparovic, Chavez *et al* 2009.

49 Fink, Grabner, Benedek *et al* 2009

50 The authors write: ‘However, to our knowledge there is no direct evidence that it is especially the right-hemispheric *temporo-parietal* regions that need to be strongly activated during creative idea generation. As outlined above, rather the contrary seems to hold true. Also, in the recent fMRI study by Howard-Jones *et al* (2005) no evidence of increased right-hemispheric *temporo-parietal* activity during creative thinking was observed. They instructed participants to generate either creative or uncreative stories and found that creative (as compared to uncreative) story generation was associated with stronger bilateral frontal and *right middle occipital* activation but lower activity in the right inferior parietal lobe near the angular gyrus’ (emphasis added). In other words the argument is not about whether the right hemisphere as a whole is involved in creativity, but about which part. However, if they did not know of evidence for right temporoparietal activation during creative idea generation, they must have overlooked several imaging and EEG studies of insight and creative thinking which show just such an association: Schneider, Gur, Alavi *et al* 1996; Luo & Niki 2003; Dan’ko, Starchenko & Bechtereva 2003; Jung-Beeman, Bowden, Haberman *et al* 2004; and Chávez, Graff-Guerrero, García-Reyna *et al* 2004. They could not have known, of course, that subsequent research would find further evidence of right temporoparietal involvement: Benedek, Bergner, Könen 2011; Chi & Snyder 2011; Chi & Snyder 2012; and Kounios & Beeman 2014.

51 Dietrich 2012 (emphasis added).

APPENDIX 2

1 *The Guardian*, 19 July 2007.

2 Koch 1971 (203–4).

3 *Time*, 21 February 1964.

4 Sokal 2016/1996. The original article (1996), is well worth a look, and is available at www.physics.nyu.edu/sokal/transgress_v2/transgress_v2_singlefile.html.

5 Boghossian & Lindsay 2017.

6 Mounk 2018.

APPENDIX 3

1 Harcombe, Baker, Cooper *et al* 2015; Lamarche & Couture 2014. The sugar industry's role in funding the 1967 review in the *New England Journal of Medicine*, on which the inaccurate advice was largely based, was not mentioned by the authors. Marion Nestle (2016) comments: 'The documents leave little doubt that the intent of the industry-funded review was to reach a foregone conclusion. The investigators knew what the funder expected, and produced it ... science is not supposed to work this way.'

2 Teicholz 2015.

3 Cope & Allison 2009.

4 DiNicolantonio & Lucan 2014; Braam, Huang, Cupples *et al* 2017.

5 Fusco, Gomes, Bispo *et al* 2017.

6 Moore, Singer, Bradlee *et al* 2017.

7 Stolarz-Skrzypek, Kuznetsova, Thijs *et al* 2011.

8 Alderman & Cohen 2012; O'Donnell, Yusuf, Mente *et al* 2011.

9 Alderman 2010; Mente, O'Donnell & Yusuf 2014, 2016.

10 Paterna, Gaspare, Fasullo 2008: 'sodium depletion has detrimental renal and neurohormonal effects with worse clinical outcome'.

11 DiNicolantonio 2017.

12 Ambard & Beaujard 1904.

13 Goldstein & Leshem 2014; DiNicolantonio *op cit* (30).

14 Kurlansky 2003.

15 Walter Kempner: see DiNicolantonio *op cit* (36).

16 Intersalt Cooperative Research Group 1988.

17 Smith, Crombie, Tavendale 1988.

18 Freedman & Petitti 2001.

19 Iparraguirre 2015.

20 Cao, Willett, Rimm *et al* 2015.

21 www.hsph.harvard.edu/nutritionsource/alcohol-and-heart-disease/ (accessed 9 February 2017: emphasis added).

22 Knott, Bell & Britton 2015; Beulens, van der Schouw, Bergmann *et al* 2012; Clerc, Nanchen, Cornuz *et al* 2010; Athyros, Liberopoulos, Mikhailidis *et al* 2007; and Baliunas, Taylor, Irving *et al* 2009.

23 Holst, Becker, Jørgensen *et al* 2017.

24 www.nice.org.uk/guidance/ng16/ (accessed 9 February 2017).

25 Berntsen, Kragstrup, Siersma *et al* 2015.

26 Ilomaki, Jokanovic, Tan *et al* 2015. Of course not every paper is in accord. As I write, one paper suggests that even moderate alcohol consumption might cause some brain damage: Topiwala, Allan, Valkanova *et al* 2017. However, even in their sample, 'higher but non-dependent alcohol use was not

associated with subsequent frontal brain atrophy or impaired cognition'. Of course neither this, nor the fact that their results are not supported by the majority of other studies, hinders their expressing the view that their results 'call into question the current US guidelines, which suggest that up to 24.5 units a week is safe for men'. White hat award, please.

27 Mehta & Myrskylä 2017.

28 GBD 2016 Alcohol Collaborators 2018.

29 <https://medium.com/wintoncentre/bizarre-conclusions-from-alcohol-study-853ea236992e>; <https://medium.com/wintoncentre/the-risks-of-alcohol-again-2ae8cb006a4a>.

30 Wood, Kaptoge, Butterworth *et al* 2018.

31 www.theguardian.com/society/2018/aug/23/no-healthy-level-of-alcohol-consumption-says-major-study.

32 *National Institute on Alcohol Abuse and Alcoholism, Alcohol Alert*, no. 46, December 1999; Levitt, Li, DeMaster *et al* 1997; Tuyns & Pequignot 1984; Gavalier & Arria 1995; Hall 1995; Ikejima, Enomoto, Iimuro *et al* 1998.

33 Later it transpired that the policy statements were shaped by a number of influential abstinence campaigners. Four key figures behind the government guidance, including Professor Gerard Hastings, who admits having omitted to declare his links, were either members of, or closely involved with, the so-called 'Institute of Alcohol Studies' (IAS), a lobby group financed by the temperance movement. This impressively titled institute is a subsidiary company and trading arm of the Alliance House Foundation, which, until it changed its name in 2003, was known as 'The UK Temperance Alliance', having started life in 1853 as the 'United Kingdom Alliance for the Suppression of the Traffic in all Intoxicating Liquors', and whose purpose, as described in its annual return to Companies House, is to 'spread the principles of total abstinence from alcoholic drinks'. *The Times* reported information from a confidential source with close knowledge of the meetings that had taken place over a period of years, as well as sources who were 'concerned at the tone and nature of some of the discussions they witnessed'. Apparently the IAS was more heavily represented on the committees drawing up the guidelines than any other body (information in this note is from a ruling of the Independent Press Standards Organisation (04923-16 *Brown v The Times*), after a complaint by one of the lobbyists was found to be unsubstantiated: www.ipso.co.uk/rulings-and-resolution-statements/ruling/?id=04923-16). As one Member of Parliament put it, 'that is not quite putting Dracula in charge of a blood bank, but it is not far off' (*House of Commons Hansard*, volume 612, entry for 28 June 2016, reporting Byron Davies, MP for Gower). 'The core funding for IAS comes from a separate educational charity called the Alliance House Foundation (no. 208554), of which IAS is a subsidiary company' (from the IAS's own website: www.ias.org.uk/Who-we-are.aspx). For the record, Professor Hastings is neither a scientist nor a doctor, but an expert on marketing, who has in the past successfully targeted the tobacco industry. A scientist with knowledge of the panel's workings told *The Times* newspaper there was a move afoot to 'demonise alcohol in the same way as cigarettes but without the justification' (*The Times*, 30 May 2016)

34 See McGilchrist 2009b (435–6).

35 Tomiyama, Hunger, Nguyen-Cuu *et al* 2016.

36 Rumbelow 2016.

37 Valtin 2002; Negoianu & Goldfarb 2008.

20. THE COINCIDENTIA OPPOSITORUM

1 Peirce 1931–60, vol 1, §457.

2 As quoted in Delbrück 1986 (167). A similar formulation – ‘you can recognize a deep truth by the feature that its opposite is also a deep truth’ – is sometimes attributed to physicist Frank Wilczek, because he included it in an account of Bohr’s philosophy in his 2015 book *A Beautiful Question: Finding Nature’s Deep Design*; but the context makes clear that he is (appreciatively) paraphrasing Bohr.

3 Hölderlin, *Hyperion*, ‘Hyperion an Bellarmin VIII’: » *Des Herzens Woge schäumte nicht so schön empor, und würde Geist, wenn nicht der alte stumme Fels, das Schicksal, ihr entgegenstände.* «

4 This account is derived from a landmark of Onondaga literature, dictated in 1900 by the Onondaga orator and priest, John Arthur Gibson, to his collaborator, JNB Hewitt, who was gathering material for his *Iroquoian Cosmology* (1903, 1928). In this passage I am relying on a substantial report of the myth contained in Needleman 2003 (204–12), who in turn was dependent on Hewitt: all quotations here are verbatim from Needleman, including any emphasis. I am grateful to Robert Bringhurst for helping me understand the provenance of this account. Bringhurst points out that the names of the two brothers in current Onondaga orthography would be Tháęhya.wá?gih and Ohá.æ?. I am also grateful to the anthropologist Stefano Fait, who noticed ‘a number of impressive parallels’ between the story and the structure of our brains, for bringing this remarkable passage to my attention.

5 Needleman 2003 (204).

6 Nietzsche 1962 (68). Heraclitus was, according to Karl Popper, ‘a thinker of unsurpassed power and originality’ (1994, 16).

7 Heraclitus fr LXXVIII [Diels 51, Marcovich 27] (trans C Kahn).

8 The usual word in Attic Greek is ἁρμονία (*harmonia*); Heraclitus uses the Ionic form ἁρμονίη (*harmonīē*). I have followed Kahn’s preference for Heraclitus’ usage, as I have in his preference for Heraclitus’ Ionic σύλλαψις (*syllapsis*) over the Attic σύλληψις (*syllēpsis*).

9 Kahn 1979 (196–200).

10 Heraclitus fr CXXIV [Diels 10, Marcovich 25] (trans C Kahn).

11 Heraclitus fr LI [Diels 91, Marcovich 40c3] (trans C Kahn).

12 Piazza, Lummen, Quiñonez *et al* 2015. Experiment shows an ensemble that has simultaneous wave-like and particle-like properties, but no specific particle was observed to behave as a particle and wave at the same time. But then the concept of a specific particle maybe simplistic: see Hut [undated].

13 It is also what Kriti Sharma noticed about the interdependent nature of living organisms, both with one another and their environment: they and their environment are *simultaneously* constituted, not by a process of sequent alternation.

14 Hugo, Preface to *Cromwell*, §60.

15 Empson 1949 (xiii).

16 Cited at Simpson 1948 (316).

17 For a perfect example of what I mean, see Carnap 1931.

18 But a self-sacrificing God is a universal insight, and is most familiar in the Christian *mythos*.

19 Hegel 1969, §187 (emphasis in original).

20 Watts 1989 (35).

21 *Upanishads*, trans S Radhakrishnan, 1953 (27): *Brihad-aranyaka*, iv, §4, 22 (emphasis added). Such boundaries are well-imaged by the ear drum, which separates inner from outer ear, but also connects them: its purpose is transmission of sound, and without it, the sound would not only not be transmitted, but could not arise. See Cilliers 2008 (48).

22 Hegel 1975, Part I, §48 (emphasis added).

23 Throughout this passage, the 1874 edition had used the word ‘contrary’ for ‘opposite’ (*entgegengesetzt*). The revision made in 1892 seems to me preferable.

24 Schleiermacher 1994 (3–5). NB: this, the standard English translation, is taken from the third edition of Schleiermacher’s text of 1831; this passage does not exist in quite this form in the 1799 edition.

25 Pascal 1976, §384 (Lafuma §177) : « *Contradiction est une mauvaise marque de vérité. Plusieurs choses certaines sont contredites. Plusieurs fausses passent sans contradiction. Ni la contradiction n’est marque de fausseté ni l’incontradiction n’est marque de vérité* » – ‘Contradiction is a poor criterion of truth. Many things that are certain are contradicted; many things that are false pass without contradiction. Contradiction is not a sign of falsehood, nor the lack of contradiction a sign of truth.’

26 Equally Abelard, in the twelfth century, wrote a treatise called *Sic et Non*, which means literally ‘Yes and No’, in which he set out 158 propositions from theology which could be logically argued for or against. It is thought to have been intended to train students in logic.

27 Quoted in Florensky 2004, where the phrase *vpolne zakonomerniye* is translated as ‘orderly’. I have substituted the more literal translation.

28 Bergson 1912 (39–40; emphasis added).

29 Whitehead 1954 (19).

30 Suzuki 1999 (66).

31 Whitehead, as reported by his wife, Evelyn Wade, in Whitehead 1954 (19).

32 Kazin 2011 (217): entry for 2 June 1957 (emphases in original).

33 Needleman 2016 (20).

34 An example of the first might be the Hindu philosophy of Sāṅkhāra; of the second, the biblical and Islamic doctrines of the transcendence of God: see Cousins 1978 (20).

35 » *Die gerade Linie führt zum Untergang der Menschheit* « (from the 1954 catalogue of his first exhibition in Paris at the studio of Paul Facchetti, written in December 1953).

36 Hundertwasser 1985.

37 Empedocles, fr DK31: B 17.9–13.

38 Schelling 1806 (56): » ... *ihr wahres Wesen erkennst du allein in dem Band, kraft dessen sie ihre Einheit ewig als die Vielheit ihrer Dinge, und hinwiederum diese Vielheit als ihre Einheit setzt. Du stellst dir auch nicht vor, daß es außer dieser Unendlichkeit von Dingen, die in ihr befindlich sind, noch eine andere Erde gebe, welche die Einheit dieser Dinge ist, sondern dasselbe was die Vielheit ist, dasselbe ist auch die Einheit, und was die Einheit ist, dasselbe ist auch die Vielheit, und dieses notwendige und unauslöslche Eins der Einheit und Vielheit selbst in ihr nennst du ihre Existenz ... Existenz ist das Band eines Wesens als Eines mit ihm selbst als einem Vielem.* « (emphasis in original).

39 In this paragraph I draw on a private communication from Eric Kaplan, to whom I am grateful.

40 These are known as *chesed* and *gevurah* respectively.

- [41](#) Schleiermacher 1994 (3–5).
- [42](#) Empedocles, fr DK31: B 17.1–2
- [43](#) Nietzsche 2001, §19 (43: emphasis in original).
- [44](#) Luckey 1991.
- [45](#) Vaiserman 2010.
- [46](#) Castillo, Schoderbek, Dulal *et al* 2015.
- [47](#) Csaba 2019.
- [48](#) Son, Camandola & Mattson 2008; Hayes 2007; Le Bourg 2009.
- [49](#) Kociba, Keyes, Beyer *et al* 1978; Calabrese, Baldwin & Holland 1999.
- [50](#) Tuomisto, Pekkanen, Kiviranta *et al* 2006.
- [51](#) Calabrese & Mattson 2017 (emphasis added).
- [52](#) Radak, Chung, Koltai *et al* 2008.
- [53](#) Coleridge 1957, §1017 (emphasis in original).
- [54](#) Taleb 2013.
- [55](#) Midrash 1977, vol 1 (370).
- [56](#) Hegel 1975, Part I, note to §81.
- [57](#) Montaigne 1991: Bk III, ch xiii, ‘Of experience’ (1243).
- [58](#) *ibid* (1216).
- [59](#) James 1909a (96).
- [60](#) In Crabb Robinson 1869, entry for 10 December 1825: ‘Though he spoke of his happiness, he spoke of past sufferings, and of sufferings as necessary. “There is suffering in heaven, for where there is the capacity of enjoyment, there is the capacity of pain.”’ As quoted in Symons 1907 (259). Cf Nietzsche: ‘What if pleasure and displeasure are so intertwined together that whoever *wants* as much as possible of one *must* also have as much as possible of the other – that whoever wants to learn to “jubilate up to the heavens” must also be prepared for “grief unto death”?’ (Nietzsche 2001: Bk I, §12, 37–8). Nietzsche refers to Goethe’s *Egmont*, Act III, sc ii.
- [61](#) Blake, ‘Auguries of Innocence’, lines 55–6 & 59–62.
- [62](#) Leopardi, ‘L’infinito’, trans Nigel McGilchrist, who comments: ‘It is conventional to translate *siepe* as a hedgerow, which is exactly what it means in current Italian usage. But in older garden-design tracts *siepe* is often used to mean a “break of trees”. Since the land drops sharply below the spot in Recanati where Leopardi is said to have composed the poem, only a line of tall trees rising from further down the slope, rather than a hedgerow, would effectively occlude his view.’
- [63](#) From Empson 1993 (46: emphasis added). Cf Schlegel 1991, §53: ‘It’s equally fatal for the mind to have a system and to have none. It will simply have to decide to combine the two’.
- [64](#) James 1909a (98–9).
- [65](#) Wendell Holmes 1961 (109).
- [66](#) Campbell 1991 (10).
- [67](#) Jung 1953–79, vol 9i, §397.
- [68](#) This is a demonstration of the importance of certain ‘keystone species’ to a stable ecology. Such species are usually, but not inevitably, predators. The concept derives from ground-breaking work by the ecologist Robert Paine (1966).
- [69](#) Scheler 2008 (78).

70 James 1902 (157).

71 Scharf 2014.

72 Stewart & Golubitsky 1992 (60).

73 Curie 1894 (400–1: emphasis in penultimate sentence in original): « ... *certains éléments de symétrie peuvent coexister avec certains phénomènes, mais ils ne sont pas nécessaires. Ce qui est nécessaire, c'est que certains éléments de symétrie n'existent pas. C'est la dissymétrie qui crée le phénomène ... les effets produits peuvent être plus symétriques que les causes.* »

74 For a penetrating insight into this logical 'paradox' in relation to the nature of Christ, see McCosker 2008 (esp 211).

75 This is a humorous retelling of a combination of two Talmudic passages (each only slightly different from the other). The original sources are from the Gittin and Eruvin, two volumes within the Talmud. Apparently a story similar to this is told in the 1971 film, *Fiddler on the Roof*. I am grateful to the late Rabbi Jonathan Sacks for this information.

76 The e-book (2018) is available free under a Creative Commons licence at physical-spirituality.neocities.org.

77 That is certainly true of major civilisations. In at least some sustainable oral cultures, what gets passed down, stored, retained, includes myths with no fixed 'interpretation' — uncodifiable knowledge that is nevertheless essential for survival: knowledge that insists on developing, in the listener, the skill required for understanding it. (Thanks to Jan Zwicky.)

78 Einstein 1976 (260).

79 James 1902 (388: emphasis in original).

80 Drob 1997.

81 Jung 1953–79, vol 12, §186.

82 Goethe 1948–, vol 16 (199): *Farbenlehre*, §739: » *Das Geeinte zu entzweien, das Entzweite zu einigen, ist das Leben der Natur; dies ist die ewige Systole und Diastole, die ewige Synkrisis und Diakrisis, das Ein- und Ausatmen der Welt, in der wir leben, weben und sind.* «

83 In general the human heart beat, when it is in what is called sinus rhythm (that is to say, beating normally) is considerably variable, though regular: the interval between beats in any one sequence may vary from, say, around 0.85 to 1.35 beats per second. Loss of such variability is again a sign of stress and is not desirable. Note, this is quite distinct from an arrhythmia, which is normally undesirable, and in which the underlying regularity of beat structure is either temporarily or permanently lost.

84 I say 'more usually', because a melodic line also contains harmonies – ones that are not concurrent at a single moment.

85 Sakhno & Tersis 2008 (320): 'Etymologically one and the same word'.

86 Oliver 2019 (7).

87 Penttonen & Buzsáki 2003.

88 Goodrich 2010 (emphasis in original).

89 *ibid.*

90 Li & Bowerman 2010.

91 Schelling 1798 (202ff): 'Von den negativen Bedingungen des Lebensprocesses'.

92 Thompson 1992 (334).

93 This passage comes from a chapter called ‘The diviners by turtle shell and milfoil’, which was added to the *Historical Records (Shih chi)* after Ssu-ma Ch’ien’s death, by someone calling himself Mr Ch’u. It is a very early addition, however – probably of the first century BC. For the translation and an explanation of this passage I am indebted to the kindness of my erstwhile All Souls colleague, the consummate sinologist David Hawkes, who drew it to my attention, and encouraged – as many might not have done – my naïve interest in all things Chinese. I am told that Persian rugs also traditionally contain an imperfect stitch.

21. THE ONE AND THE MANY

1 Heraclitus fr XXXVI [Diels 50, Marcovich 26] (trans IMcG). The phrase is normally translated in the first sense, emphasising the unity of multiplicity: the Greek elegantly, and in the true spirit of Heraclitus, equally permits the second, emphasising the multiplicity of unity. And thus unifies division and union at a meta-level.

2 From a course description for Philosophy I in ‘Spring Bulletin’, *The New Yorker*, 29 April 1967 (37).

3 Muir 1875 (364). Nearly 200 years earlier, Leibniz wrote in a letter to Arnaud, dated September 1687: « *Toutes les substances sympathisent avec toutes les autres et reçoivent quelque changement proportionnel répondant au moindre changement qui arrive dans tout l’Univers ...* » – ‘every substance is in sympathy with every other, and is to some degree altered in response to the least change that occurs in the entire universe ...’.

4 Kolakowski 1985 (20).

5 Smolin 2013 (215).

6 Hopkins 1963.

7 I am greatly indebted to John Cutting for his insights here. The quote comes from a personal communication. He deals with this at greater length in a published article (2018).

8 According to Nicholas of Cusa, the greatest philosophical and scientific mind of the fifteenth century, ‘individual specimens are all that exist, but not only are they contracted images of God’s oneness, but also contracted images of their types insofar as each more or less fulfils the possibilities of its nature.’ This insight draws together the different levels of difference and sameness across the entire cosmos from the lowliest existing thing to God. See Miller 2017.

9 Hopkins *op cit* (103).

10 Wordsworth 1876, vol II (96).

11 Begbie 2008 (89–90).

12 James 1897, ‘The importance of individuals’: 255–62 (256–7).

13 Whitehead 1926a.

14 Heidegger, ‘Das Ge-stell’; in *Gesamtausgabe*, vol 79, 1994 (36); a still never officially translated lecture, here in the translation offered *en passant* in Levin 1999 (121).

15 James 1897, ‘The sentiment of rationality’: 63–110 (70: emphasis added). Bergson similarly thought that our ability to produce and understand generalities evolved purely for practical purposes, enabling us to classify our surroundings in such a way as to achieve maximum utility.

16 Da Ponte’s libretto for *Don Giovanni*, Act I, sc v.

17 Nietzsche 1970 (234).

18 Nietzsche 1967, §503 (emphasis in original in all quotations from Nietzsche on this page).

19 *ibid*, §515.

20 *ibid*, §499.

21 *ibid*, §501.

22 *ibid*, §510.

23 *ibid*, §511. *Geist* can mean ‘intellect’ or ‘spirit’; ‘intellect’ is here less confusing and I have accordingly substituted it.

24 Solzhenitsyn 1973 (33).

25 Whitehead 1933 (181: emphasis added).

26 Blake, *Jerusalem*, ch 3, Plate 55, lines 60–4.

27 Zwicky 2014b, §55.

28 Mu 2009 (45): ‘In sum, the *dao* is the ultimate source, unifying power, and fundamental principle of nature and the universe; it manifests itself through particular individual things’.

29 Zwicky 2014b, §53(a).

30 Hopkins 1963 (145–6).

31 *Hæcceitas* (variously, also, *hæccitas* or *hæceitas*) was the term used by the mediaeval philosopher and theologian Duns Scotus to denote the *principium individuationis*, or formal principle of individuation – that which, for example, makes you not just ‘a person’ but the unrepeatable person you are. Hopkins was greatly influenced by Duns Scotus (‘who of all men most sways my spirits to peace’), and invented the term ‘inscape’ to refer to the incarnate manifestations of this principle in the individual nature of every creature.

32 Blake, *The Marriage of Heaven and Hell*, Plate 24.

33 *ibid*, Plate 8, line 19.

34 Chief Sitting Bull 1883, quoted 1973 (see bibliography). There is a further layer of meaning: Sitting Bull was a Lakota Sioux, whose symbol is an eagle; and they and the Crow Indians were long-standing enemies. The Crow had sided with the US troops.

35 Collingwood 1983 (101).

36 McElroy & Stroh 2013.

37 Chatham, Claus, Kim *et al* 2012; Aron, Robbins & Poldrack 2014.

38 The distinction is important in Spinoza. For a discussion, see Antonio Negri who writes: ‘*potestas* refers to power in its fixed, institutional or “constituted form”, while *potentia* refers to power in its fluid, dynamic or “constitutive” form’ (2004, 15). In English, our words ‘potential’ and ‘power’ tend to conflate the meaning; by contrast, French (*puissance/pouvoir*) and Italian (*potenza/potere*) do not.

39 Heraclitus fr XL [Diels 90, Marcovich 54] (trans C Kahn).

40 Blake, *The Marriage of Heaven and Hell*, Plate 7, ‘Proverbs of Hell’; and letter to William Hayley, 6 May 1800.

41 Flourens 1948 (139).

42 A response to Edmond Malone’s comment, ‘generalising and classification is the great glory of the human mind’; in marginalia to Blake’s copy, now in the British Library, of *The Works of Sir Joshua Reynolds* in 3 vols, Cadell & Davies, London, 1798, vol 1: ‘An account of the life and writings of the author’, by Edmond Malone (xcviii).

43 In the film *The Life of Brian*, the Christ-figure, Brian, expostulates with a crowd of followers: ‘Look, you don’t need to follow me, you don’t need to follow anyone. You’re all different.’ In unison they reply: ‘Yes, we are *all different*’. ‘No, you don’t understand. You are *all individuals*.’ In unison they reply: ‘Yes, we are *all individuals*.’ Immediately after, one little bloke objects: ‘I’m not’.

44 *Maxims I A* [Exeter Cathedral Library MS 3501, ff 88v–90r], lines 25–6.

45 *Maxims II* [British Library, MS Cotton Tiberius, B i, ff 115r–115v], lines 45–7.

46 *Maxims I B* [Exeter Cathedral Library MS 3501, ff 90r–91r], line 23.

- [47](#) *Maxims II*, lines 24–6.
- [48](#) *Maxims II*, lines 28–9.
- [49](#) *Maxims II*, lines 31–3.
- [50](#) *Maxims I C* [Exeter Cathedral Library MS 3501, ff 91r–92v], lines 16–17.
- [51](#) *Maxims I B*, lines 59–60.
- [52](#) *Maxims II*, line 42.
- [53](#) *Maxims II*, lines 17–19.
- [54](#) *Maxims II*, lines 23–35.
- [55](#) *Maxims II*, lines 38–40.
- [56](#) *Maxims II*, lines 40–1.
- [57](#) *Maxims I C*, lines 30–1.
- [58](#) *Maxims II*, lines 61–6.
- [59](#) Cavill 1999 (48).
- [60](#) Act IV, sc iv, lines 89–92, 95–7.
- [61](#) Laeng, Shah & Kosslyn 1999; Laeng, Zarrinpar & Kosslyn 2003; Gauthier, Behrmann & Tarr 1999; Gauthier, Tarr, Anderson *et al* 1999.
- [62](#) Laeng, Zarrinpar & Kosslyn *op cit*; Yamazaki, Aust, Huber *et al* 2007; Lux, Marshall, Ritzl *et al* 2004. Also see Halpern, Güntürkün, Hopkins *et al* 2005.
- [63](#) Grossman 1981; Laeng, Zarrinpar & Kosslyn 2003.
- [64](#) Kosslyn 1987 (emphasis added).
- [65](#) Meadows 1974.
- [66](#) Gauthier, Tarr, Moylan *et al* 2000.
- [67](#) Goldberg & Costa 1981.
- [68](#) Siniscalchi, Pergola & Quaranta 2013; Siniscalchi, Sasso, Pepe *et al* 2010; Siniscalchi, Sasso, Pepe *et al* 2011; see also congruent findings in Rogers & Andrew 2002.
- [69](#) Marzi & Berlucchi 1977; Bever & Chiarello 1974; Martin, Wiggs & Weisberg 1997; Henson, Shallice & Dolan 2000; Gold, Berman, Randolph *et al* 1996; Shadmehr & Holcomb 1997; Haier, Siegel, MacLachlan *et al* 1992; Tulving, Markowitsch, Craik *et al* 1996; Bradshaw & Nettleton 1983.
- [70](#) Craig 2005; Oppenheimer, Gelb, Girvin *et al* 1992; Wittling, Block, Genzel *et al* 1998; Sullivan 2004.
- [71](#) Eg, Bornstein 1963; Aoki, Hiroki, Bando *et al* 2003. Although all had right hemisphere lesions, interestingly not all had posterior lesions (at least one case was frontal) – see Yoshimura & Otsuki 2002.
- [72](#) Landis, Cummings, Benson *et al* 1986.
- [73](#) See, eg, Paterson & Zangwill 1945; McFie, Piercy & Zangwill 1950; Hemphill & Klein 1948; Hécaen & Angelergues 1962.
- [74](#) De Renzi, Faglioni, Scotti *et al* 1972.
- [75](#) Bornstein *op cit* (284 & 303–11).
- [76](#) Bornstein, Sroka & Munitz 1969.
- [77](#) Landis & Regard 1988.
- [78](#) Lhermitte, Chedru & Chain 1973.

- 79** Kaplan & Gardner 1989.
- 80** Černigovskaja 1993.
- 81** For comparisons with schizophrenia, see, eg, Jung, ‘Schizophrenia’: 1953–79, vol 3 (259).
- 82** Cutting 2015.
- 83** Evans & Federmeier 2007. See also Vuilleumier, Henson, Driver *et al* 2002; and Kosslyn 1987.
- 84** Asari, Konishi, Jimura *et al* 2008. See also McGilchrist 2009b (51ff *et passim*).
- 85** Pallis 1955.
- 86** Sacks 1986 (11ff).
- 87** Umiltà, Bagnara & Simion 1978. See also Blakeslee 1980; Deglin 1976.
- 88** The left hemisphere may prefer abstract art (Coney & Bruce 2004), although a more recent study found no hemispheric difference in its appreciation (Nadal, Schiavi & Cattaneo 2018). More likely what one is seeing here is a form of a (classically right hemisphere) constructional apraxia combined with visual agnosia.
- 89** Sacks 1986 (10–16; emphasis added).
- 90** Macrae & Trolle 1956.
- 91** Sacks *op cit* (19).
- 92** For a fuller treatment of the issues involved, see McGilchrist 2016.
- 93** Huxley 1992 (58).
- 94** Suzuki 1999 (8).
- 95** Hirshfield 1998 (98); quoted in Zwicky 2014b, §16.
- 96** See McGilchrist 2009b (87ff).
- 97** Fossati, Hevenor, Graham *et al* 2003; Keenan, Gallup & Falk 2003; Kircher, Senior, Phillips *et al* 2001; Decety & Sommerville 2003. Specifically the right dorsomedial frontal cortex is critical (Mega & Cummings 2001).
- 98** Bourgeault 2016 (53).
- 99** Emerson 2003 (109).
- 100** Johnstone, Cohen, Bryant *et al* 2015. See also Grattan, Bloomer, Archambault *et al* 1994. In psychopathological terms, the lack of a secure sense of the self is often associated with narcissism and lack of empathy.
- 101** For discussion, see Lawlor & Moulard-Leonard 2004.
- 102** James 1909a (281–2: emphasis added).
- 103** *ibid* (324–5).
- 104** *Bhagavad Gita*, 18: §20–1 (trans J Mascaró).
- 105** James *op cit* (120).
- 106** *ibid* (118–9).

2.2. TIME

- 1 Whitehead 1922 (222).
- 2 Augustine, *Confessions*, Bk XI, ch xiv, §17: ‘*Quid est enim tempus?*’
- 3 Newton 1687.
- 4 Schopenhauer 2000, vol II (33): » *Denn dem spekulativen Geiste drängen sich vor allen diese Fragen auf: Was ist die Zeit? was ist dies Wesen, das aus lauter Bewegung besteht, ohne etwas, das sich bewegt? – und was der Raum? dieses allgegenwärtige Nichts, aus welchem kein Ding herauskann, ohne aufzuhören Etwas zu seyn? ... [Es bleibt die gänzliche] Unmöglichkeit Zeit und Raum hinwegzudenken, während man Alles, was in ihnen sich darstellt, sehr leicht hinwegdenkt. Die Hand kann Alles fahren lassen; nur sich selbst nicht.* «
- 5 Waismann 1968 (6).
- 6 Einstein 1961 (vii).
- 7 Allen 1880 (140).
- 8 Heschel 2005 (5).
- 9 *ibid* (7).
- 10 I am indebted to Jeannemarie Gescher for this information. She points out that *wu shi* comes from the Southern Chinese tradition, considered more liberal than that of the North.
- 11 Nietzsche 2003b, §11 (212: emphasis in original).
- 12 Hasegawa 2012 (172). The reference is to Onō 1978. In 1930s Japan, a silent movie created a sensation and achieved box office success, reportedly due in great part to its linguistically eccentric title, *Nani ga kanojo o sō saseta ka* (*What made her do it?*). It used familiar vocabulary and familiar grammatical structure, but it juxtaposed an abstract subject to the causative predicate, which just did not happen in normal Japanese.
- 13 Kawasaki 2002.
- 14 Jaynes 1993 (60).
- 15 Eg, Tordjman 2015; Le Guen & Balam 2012; and the Blackfoot (Kainai) elder Leroy Little Bear (personal communication).
- 16 See, esp, Wessels 2013.
- 17 Eg, Toynbee 1934–61: see Balslev 2014.
- 18 Pallasmaa 2005.
- 19 Proust 1992 (68–9).
- 20 For Aymara, see Núñez & Sweetser 2006; for Malagasy, see Lewis 2006 (61).
- 21 Miles, Tan, Noble *et al* 2011.
- 22 Li & Du 1987.
- 23 Rugani, Vallortigara, Priftis *et al* 2015.
- 24 Saj, Fuhrman, Vuilleumier *et al* 2013.
- 25 Pun, Adamo, Weger *et al* 2010.
- 26 Boroditsky & Gaby 2010.

- [27](#) Núñez, Cooperrider, Doan *et al* 2012.
- [28](#) Bylund & Athanasopoulos 2017.
- [29](#) Casasanto & Boroditsky 2008; Casasanto, Fotakopoulou & Boroditsky 2010.
- [30](#) Clark 1973.
- [31](#) Bergson 1910 (101).
- [32](#) Robbins 2000.
- [33](#) See the work of, eg, Alva Noë, Riccardo Manzotti and others.
- [34](#) Canales 2016a (64).
- [35](#) Canales *op cit*.
- [36](#) Canales 2016b (237–8). Amusingly, a zealous ‘editor’ of the Wikipedia entry for Eugène Minkowski has interpolated in italics the urgent warning: ‘his book “*Le Temps vécu*” (*Lived Time*) is closely linked to Bergson’s philosophy and his anti-scientific ideas, so all the book of Minkowski, including “psychopathological studies”, is in doubt.’ Even by Wikipedia standards this is prime tripe. First, there’s no way an association with Bergson could invalidate a lifetime’s careful observation of patients, even if Bergson was wrong about the nature of time, which in the opinion of many philosophers and physicists he was not. Second, Bergson is not anti-scientific in the least: it is hard to think of a philosopher of his age who had greater respect for, and interest in, physics and mathematics. Third, Minkowski was himself not in any way anti-scientific. And fourth, to support his anxious interpolation, the ‘editor’ refers to Canales’s book, page 215. Unfortunately the ‘Minkowski’ referred to there is the Russo-German mathematician Hermann Minkowski, nothing to do with the French psychiatrist; and in any case the whole tenor of Canales’s book is to challenge precisely this unreflective prejudice, and so presumably was not read by the ‘editor’ in question.
- [37](#) For further discussion, see Frank 2016.
- [38](#) de Broglie 1969 (50).
- [39](#) de Broglie *op cit* (47).
- [40](#) Bergson 1910 (111).
- [41](#) de Broglie *op cit* (54).
- [42](#) Robbins 2000.
- [43](#) Kolakowski 1985 (8 & 16).
- [44](#) Bergson 1970 (96).
- [45](#) Kolakowski *op cit* (18)
- [46](#) Bergson 1908 (179): « *L’intelligence est caractérisée par une incompréhension naturelle de la vie* » – ‘Intelligence is defined by a natural lack of understanding of life’.
- [47](#) This is similar to Nietzsche’s insight that ‘the “being” of things has been *inserted* by us (for practical, useful, perspectival reasons)’: 2003b, §11[73] (212: emphasis in original).
- [48](#) Bergson 1912 (71); and 2007b (19: emphasis added).
- [49](#) Smolin 2013 (35: emphasis in original).
- [50](#) Bergson 2007a (6).
- [51](#) Schopenhauer 2000, vol II (33).
- [52](#) Lawlor & Moulard-Leonard 2004.
- [53](#) Bergson 2007e (122: in the original the whole passage is italicised).
- [54](#) Bergson 2007d (105).

- [55](#) Bergson 2007e (124).
- [56](#) Bergson *op cit* (124–45).
- [57](#) Bergson *op cit* (123).
- [58](#) Bergson *op cit* (113–4: emphasis added).
- [59](#) Bergson *op cit* (115).
- [60](#) Bergson *op cit* (116).
- [61](#) Bergson 2011: « *Je dirais qu'il faut agir en homme de pensée et penser en homme d'action.* »
- [62](#) Bergson 2007e (125).
- [63](#) Bergson *op cit* (131–2). This is the argument of Chapter 16 of this book.
- [64](#) Bergson 2007d (106).
- [65](#) Merleau-Ponty 1962 (482: emphasis on 'passage' in original, other emphases added).
- [66](#) Goethe 1972, 545–73 (563: emphasis added): » *Die Vernunft ist auf das Werdende, der Verstand auf das Gewordene angewiesen ... Sie erfreut sich am Entwickeln; er wünscht alles festzuhalten, damit er es nutzen könne* «.
- [67](#) Rosenthal 1996 (556).
- [68](#) Bergson 2007a (5: emphasis in original); and Bergson 2007e (119–20).
- [69](#) Sherover 1989 (281).
- [70](#) Descartes.
- [71](#) James 1909a (236–7).
- [72](#) Cottingham 1978 (552). Cottingham argues that this did not necessarily entail for Descartes that they had no feelings.
- [73](#) Descartes, 'Second Meditation': 2017 (26).
- [74](#) Chapman 1966.
- [75](#) Cutting 1997 (112–14).
- [76](#) Hécaen & de Ajuriaguerra 1952 (309 & 369–70): « *L'expérience du temps vécu, la modification du temps personnel, apparaît ainsi comme au centre du syndrome [de schizophrénie] ... Privés de ce pouvoir intégrateur du temps, les malades arrivent selon l'expression de Minkowski à un « dualisme morbide » à partir duquel peut s'effondrer jusqu'au sentiment de l'existence ... Par la perte du synchronisme vécu qui est perte du dynamisme et entrée du statique dans les phénomènes vitaux, se rompt la « solidarité organo-psychique » ... la synthèse de la personnalité se désagrège à mesure que le statique remplace le dynamique.* » « *À plusieurs reprises, nous avons trouvé une atteinte de la notion du temps chez les sujets présentant des modifications de la somatognosie. Tantôt c'est le sentiment de notre continuité, le temps vécu, la durée qui sont troublés chez les malades et la synthèse du moi semble se défaire en ses diverses constituantes évolutives non décomposables, chez l'individu normal ... L'atteinte des données temporelles désautomatise notre vie psychique et cette désautomatisation nous fait appréhender plus ou moins exactement notre corps en tant que forme séparée de notre personnalité.* »
- [77](#) Stanghellini, Ballerini, Presenza *et al* 2016.
- [78](#) Fischer 1930b (469).
- [79](#) Hécaen & de Ajuriaguerra 1952 (309).
- [80](#) Binswanger 1987 (86). Thus in Sass 2017 (471, n43).

81 Fischer *op cit* (470). Fischer's views are however less clear-cut than Minkowski's better-known report of them: Minkowski 1968 (258).

82 Jaspers 1963 (86).

83 Mancini, Presenza, Di Bernardo *et al* 2014.

84 Jaspers *op cit* (82 & 87: emphasis in original).

85 Tellenbach 1956a (12): » *Der Zeitstillstand ist unendlich, ich lebe in einer stehenden Ewigkeit. Ich sehe, daß die Uhren sich drehen, aber für mich vergeht die Zeit nicht* «. Also Jaspers 1963 (87).

86 Jaspers *op cit* (87: emphasis in original).

87 Muscatello & Giovanardi Rossi 1967 (784ff): '*Il tempo per me è fermo completamente, mi sembra ... Guardo l'orologio e mi sembra, se lo riguardo, che sia trascorsa una distanza di tempo enorme, come se fossero trascorse delle ore, mentre invece sono trascorsi pochi minuti. Mi sembra un tempo enorme che sta passando. Il tempo non passa mai, guardo l'orologio, ma le lancette sono sempre ferme nella stessa posizione, non si muovono mai, non vanno mai avanti; allora sento se l'orologio si è fermato, sento che batte, ma le lancette sono sempre ferme. Al passato non penso ... Non mi veniva in mente niente, niente ... non riuscivo a pensare a niente. Non riuscivo a prospettarmi niente, niente in futuro. Per me il tempo presente non esiste quando sto così male ... non esiste il passato, non esiste il futuro.*'

88 Jaspers *op cit* (87: emphasis in original).

89 See McGilchrist 2009b (esp 336 & 400–3).

90 Fuchs 2013 (emphasis added).

91 Minkowski 1970 (279). See also Schreber 1955 (135): 'Apart from daily morning and afternoon walks in the garden, I mainly sat motionless the whole day on a chair at my table, did not even move towards the window, where by the way nothing was to be seen except green trees ...'

92 This is the same individual reported at Minkowski 1987 (209).

93 Minkowski 2002 (145): « *C'est du mouvement, je n'aime pas beaucoup ça* ».

94 Ortuño, Guillén-Grima, López-García *et al* 2011.

95 Lalanne, van Assche & Giersch 2012.

96 Lalanne, van Assche, Wang *et al* 2012; Foucher, Lacambre, Pham *et al* 2007; Giersch, Lalanne, Corves *et al* 2009; Schmidt, McFarland, Ahmed *et al* 2011.

97 Capa, Duval, Blaison *et al* 2014. These findings are interesting, too, because it seems to me that failures to observe temporal order might give rise to misperceiving causal influences, a common problem in delusions. If you seem to experience the thought 'Beckham shoots for goal' not immediately after, as is normal, but at the same time as, or just before, Beckham shoots for goal, you may believe that you influence Beckham to score the goal – therefore that events can, apparently, be brought about by thinking them.

98 Events flow: Giersch, Poncelet, Capa *et al* 2015. Melody: a significant and specific impairment of melody appreciation is found in schizophrenia (Kantrowitz, Scaramello, Jakubovitz *et al* 2014).

99 Wahl & Sieg 1980; Tysk 1984; Tracy, Monaco, McMichael *et al* 1998; Volz, Nenadic, Gaser *et al* 2001; Elvevåg, McCormack, Gilbert *et al* 2003; Carroll, Boggs, O'Donnell *et al* 2008; Lee, Bhaker, Mysore *et al* 2009; Waters & Jablensky 2009.

100 Bergson 1912 (11: emphasis added).

101 James 1909a (239: emphasis in original; & 243–4: emphasis added).

102 *ibid* (261).

103 The distinguished eighteenth-century mathematician Pierre-Simon Laplace taught that the future could be predicted with certainty if one knew everything about the past.

104 Muller 2016 (9–10).

105 *ibid* (277).

106 Oliver 2019 (102 & 107).

107 Smolin 2013 (xvi–xvii).

108 Bergson 2007f (83).

109 Heidegger 1962, Int II (63); 1986 (38): » *Höher als die Wirklichkeit steht die Möglichkeit* «.

110 Bergson 2007a (9).

111 Bergson 2007a (8 & 10).

112 See, eg, Eliot 1941 (25–626): ‘What happens when a new work of art is created is something that happens simultaneously to all the works of art that preceded it. The existing monuments form an ideal order among themselves, which is modified by the introduction of the new (the really new) work of art among them ... the relations, proportions, values of each work of art towards the whole are readjusted ... Whoever has approved this idea of order, of the form of European, of English literature will not find it preposterous that the past should be altered by the present as much as the present is directed by the past.’

113 Borges, ‘Kafka and his precursors’: 1964a (236: emphasis in original).

114 Bergson 2007a (12).

115 Bergson 2007e (113).

116 Bergson 2007e (110).

117 Smolin 2013 (48).

118 Bergson 2007f (77).

119 Ma, Herbst, Scheidl *et al* 2012; Yin, Cao, Yong *et al* 2013.

120 Robbins 2004 (783), referring to de Broglie 1969. This paragraph is based on my reading of Robbins, and at times follows approximately his wording.

121 Nottale 1996; Feynman & Hibbs 1965. Both cited in Robbins *op cit*.

122 Robbins *op cit* (783).

123 Bergson 1965 (116–7): « *De quel objet, extérieurement aperçu, peut-on dire qu’il se meut, de quel autre qu’il reste immobile? Poser une pareille question, c’est admettre que la discontinuité établie par le sens commun entre des objets indépendants les uns des autres, ayant chacun leur individualité, comparables à des espèces de personnes, est une distinction fondée. Dans l’hypothèse contraire, en effet, il ne s’agirait plus de savoir comment se produisent, dans telles parties déterminées de la matière, des changements de position, mais comment s’accomplit, dans le tout, un changement d’aspect, changement dont il nous resterait d’ailleurs à déterminer la nature.* » The standard translation by Paul and Palmer would appear to miss the meaning.

124 Bergson 1965 (117): « *Comment morcelons-nous la continuité primitivement aperçue de l’étendue matérielle en autant de corps, dont chacun aurait sa substance et son individualité? Sans doute cette continuité change d’aspect, d’un moment à l’autre : mais pourquoi ne constatons-nous pas purement et simplement que l’ensemble a changé, comme si l’on avait tourné un kaléidoscope? Pourquoi cherchons-nous enfin, dans la mobilité de l’ensemble, des pistes suivies par des corps en mouvement? Une continuité mouvante nous est donnée, où tout change et demeure à la fois : d’où vient que nous dissociions ces deux termes, permanence et changement, pour représenter la permanence par des corps et le changement par des mouvements homogènes dans l’espace? Ce n’est*

pas là une donnée de l'intuition immédiate ; mais ce n'est pas davantage une exigence de la science, car la science, au contraire, se propose de retrouver les articulations naturelles d'un univers que nous avons découpé artificiellement. » The standard translation by Paul & Palmer is obscure and clumsy: I have tried to provide something more natural and comprehensible.

125 Leibniz, letter to Antoine Arnauld, late November 1671.

126 Robbins 2004 (783).

127 Oreshkov, Costa & Brukner 2012.

128 Anjum & Mumford 2018 (61–2).

129 Smolin 2013 (xxiii–xxiv).

130 Cf Sass & Borda 2015 (480): 'There is, in any case, no reason to make the reductionist assumption that the causal direction must always be from brain to mind rather than the reverse (or even that causality is the best formulation of mind-brain relationships)'.

131 Muller 2016 (285ff).

132 See Gare 2018.

133 Ho & Popp 1994 (432).

134 Schiller 1891 (75–6).

135 Not everything has a final cause, however. Aristotle gives the example of an eclipse as something that has no final cause: *Metaphysics*, 1044b12.

136 Borges 1964b (11).

137 Schelling 1798 (x): » *Von dieser Höhe angesehen verschwinden die einzelnen Successionen von Ursachen und Wirkungen, (die mit dem Scheine des Mechanismus uns täuschen), als unendlich kleine gerade Linien in der allgemeinen Kreislinie der Organismus, in welcher die Welt selbst fortläuft.* «

138 Bergson 2007d (106).

139 Bergson 2007e (127).

140 *ibid* (emphasis added).

141 Schrödinger 1964 (22).

142 Bergson *op cit* (128).

143 Merleau-Ponty 1962 (489).

144 This is the argument of a paper by Joseph Dien (2008). See also: Saj, Fuhrman, Vuilleumier *et al* 2013. A good example of depression and time actually going backward can be found in Kloos 1938 (237). However, there are also occasional striking examples in schizophrenia: see, eg, case 5 ('Sche') and case 7 ('Ku') in Fischer 1929 (556 & 563): see also Saniga 2014 (it is exceedingly doubtful, however, that the case of disturbance of time in patient Jesse Watkins reported by RD Laing in Chapter 7 of *The Politics of Experience* represents schizophrenia).

145 There is an engaging book on the topic by Douwe Draaisma (2004).

146 Bergson 2007e (124).

147 Fuchs 2013. See also Csikszentmihályi 2014.

148 Parry 2015 (42).

149 Pariyadath & Eagleman 2007; Tse, Intriligator, Rivest *et al* 2004; Ranganath & Rainer 2003; Ulrich, Nitschke & Rammsayer 2006.

150 Smolin 2013 (103–4).

151 Parks 2018 (75).

- 152** Canales 2016b (21).
- 153** Fuchs 2013.
- 154** *ibid.*
- 155** Ellul 1964 (330).
- 156** Borges, 'Juan Muraña': 2000 (53).
- 157** Blake, *The Marriage of Heaven And Hell*, plate 7, 'Proverbs of Hell'.
- 158** Shallis 1982 (155–6).
- 159** *ibid* (198).
- 160** Taylor 2009 (42–3 & 68: emphasis added)
- 161** Waismann 1968 (5).
- 162** Bergson 1912 (6–7: emphasis added).
- 163** Bergson 2007f (86).
- 164** Sherover 1989 (290 n).
- 165** James 1909a (47–9).
- 166** James *op cit* (50).
- 167** Borges 1964b, 'New refutation of time' (186–7).
- 168** Heidegger 1986 (331).
- 169** Merleau-Ponty 1962 (490).
- 170** Megidish, Halevy, Shacham *et al* 2013.
- 171** Gleiser 2014 (233).
- 172** Merleau-Ponty 1962 (492).
- 173** Lavelle 1973 (79 & 190).
- 174** Schmemmann 2000 (78).
- 175** Oppenheimer 1954 (69).
- 176** Borges 1999, 'Happiness' (441).
- 177** Raud 2012.
- 178** Kierkegaard 2000 (151).
- 179** Dainton 2014 (230–5).
- 180** Einstein, letter of March 1955, to Michele Besso's family following his death: 'People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion' (quoted in Dyson 1979, 193). However, Einstein may be assumed to have been merely comforting the bereaved. According to Carnap: 'Once Einstein said that the problem of the Now worried him seriously. He explained that the experience of the Now means something special for man, something essentially different from the past and the future, but that this important difference does not and cannot occur within physics. That this experience cannot be grasped by science seemed to him a matter of painful but inevitable resignation' (Schilpp 1963, 37–8). On which, Smolin comments: 'Einstein's discontent comes down to a simple insight. A scientific theory, to be successful, must explain to us the observations we make of nature. Yet the most elemental observation we make is that nature is organised by time' (Smolin 2013, 91–2). We have choice about space, about where we move and the speed at which we do so, but not about time.
- 181** Yourgrau 2005.

- 182** Lucas 1990 (8).
- 183** See, eg, Ellis 2014. A very similar viewpoint is put forward in Richard Muller’s fascinating book, *Now: The Physics of Time* (2016).
- 184** Currian 2017 (193); Gurzadyan & Penrose 2016.
- 185** Holster 2014 (12: emphasis in original).
- 186** Zeh 2014; Haag 2014; Omnès 2014.
- 187** Prigogine 1997 (27).
- 188** Smolin 2013 (226).
- 189** Scruton 1996 (80).
- 190** Smolin *op cit* (xii–xiv). ‘Time will turn out to be the only aspect of our everyday experience that is fundamental. The fact that it is always some moment in our perception, and that we experience that moment as one of a flow of moments, is not an illusion. It is the best clue we have to fundamental reality’ (*ibid*, xxxi).
- 191** *ibid* (256).
- 192** Dōgen Zenji 2007 (116).
- 193** Our English word *tide*, which used to mean ‘time’ (a usage preserved in words such as Yuletide) and by extension came to cover the tides of the sea, is cognate with German *Zeit*: both of these, as well as our more usual word *time*, come from a common root meaning to ‘stretch out’. Time, therefore, as *durée*, not as *temps*.
- 194** Prigogine 1997 (6).
- 195** Mullins 2016.
- 196** Augustine, *Confessions*, Bk XI, ch xiv, §17.
- 197** Urfer 2001 (280).
- 198** James 1909a (290: emphasis in original).
- 199** Smolin 2013 (92).
- 200** Dolev 2016 (22).
- 201** Drieschner 2014 (135).
- 202** Merleau-Ponty 1962 (492).
- 203** *Chuang Tzu*, xvii, §1.
- 204** Smolin *op cit* (257).
- 205** Simplicius, *Commentary on Aristotle’s Physics*, 24.13–21 (12A9 & 12B1).
- 206** Quoted by Aristotle, in *Nicomachean Ethics*, Bk VI, §2 ,1139b10: μόνου γὰρ αὐτοῦ καὶ θεὸς στερίσκεται, ἀγένητα ποιεῖν ἅσ’ ἂν ᾗ πεπραγμένα.
- 207** Yeats read Hegel widely: see Olsen 1983.
- 208** Hegel 1969 (68).
- 209** James 1890, vol 1 (606).
- 210** Shattuck 1988 (351–2); Sass 2017 (127).
- 211** Franklin 2004 (200).
- 212** See Lakoff & Johnson 1999 (161ff, esp 165).
- 213** Di Nicola 2018.

214 Berg & Seeber 2016.

215 Kenkō 1967, §82 & §7. The first part is actually a phrase from the poet Ton'a, which Kenkō quotes here with approbation.

216 The Latin word for business (literally, busy-ness) is *negotium*, from *nec* + *otium* – literally, 'no leisure'.

217 Pieper 1998 (30).

218 *Muße* is also 'the Muse' (Malsbary: Pieper 57 n7). For more detail, see woerterbuchnetz.de/cgi-bin/WBNetz/wbgui_py?sigle=DWB&lemma=muessen. The transition seems to have been a consequence of negation, since 'must not' means 'does not have permission'.

219 Plato described this as *pleonexia* (greed): the behaviour of a tyrant and an example of lawlessness (*Republic*, 571b5–7).

220 Schor 1992 (10 & 44–7). Schor provides extensive scholarly discussion and references (see *ibid*, 189–90, n7). The evidence on mediaeval conditions is more familiar than that regarding the *ancien régime*, on which she cites de Grazia 1962 (119).

221 Ellul 1964 (328–9).

222 Hamilton, Haier & Buchsbaum 1984.

223 Danckert & Allman 2005 (242); Jokic, Zakay & Wittmann 2018.

224 Braun, Delisle, Suffren *et al* 2013. This paper is an excellent overview of the evidence for right hemisphere deficits in ADHD. See also Panksepp, Burgdorf, Turner *et al* 2003; Braun, Archambault, Daigneault *et al* 2000; Geeraerts, Lafosse, Vaes *et al* 2008.

225 Almeida, Ricardo-Garcell, Prado *et al* 2010; Makris, Biederman, Valera *et al* 2007; Shaw, Lalonde, Lepage *et al* 2009.

226 Geeraerts, Lafosse, Vaes *et al* 2008.

227 Damrad-Frye & Laird 1989; Hamilton 1981; Wallace, Vodanovich & Restino 2003.

228 Wangh 1975 (541).

229 Sass 2017 (126–7).

230 Augustine, *De civitate Dei*, Bk XI, ch vi: '*non est mundus factus in tempore, sed cum tempore.*' Borges somewhat misremembers this in his essay on time as '*non in tempore sed cum tempore Deus creavit cælum et terram*'.

231 Rilke, *Sonnets of Orpheus*, II, §27 (trans J May).

23. FLOW AND MOVEMENT

- 1 Democritus, according to Diogenes Lærtius, *Lives of the Eminent Philosophers*, Bk IX, §45.
- 2 Bergson 2007e (119).
- 3 Newton 1687.
- 4 Brogaard, Vanni & Silvano 2013.
- 5 Padgett & Seaberg 2014 (210).
- 6 Brogaard *et al*, *op cit*.
- 7 Unpublished study: I acknowledge with thanks personal communication from Professor Brit Brogaard on this matter.
- 8 Padgett 2014b.
- 9 Padgett *et al*, *op cit* (209).
- 10 Brogaard *et al*, *op cit* (appendix).
- 11 Padgett 2014a.
- 12 Yamadori, Mori, Tabuchi *et al* 1986; Frey & Hambert 1972; Arseni & Dănilă 1977; Braun, Dumont, Duval *et al* 2004.
- 13 Padgett 2014b
- 14 Padgett *et al* 2014 (31).
- 15 Padgett 2014a.
- 16 Padgett 2014d.
- 17 Padgett *et al* 2014 (35).
- 18 Padgett 2014d.
- 19 Brogaard *et al*, *op cit* (567).
- 20 Brogaard *et al*, *op cit*.
- 21 Padgett 2014d.
- 22 Kepler 1981 (92).
- 23 Hundertwasser 1985 (State Prize acceptance speech): » *Die gerade Linie ist der Fluch unserer Zivilisation* «.
- 24 McGilchrist 2009b (76).
- 25 Padgett *et al*, *op cit* (9).
- 26 Padgett 2014a.
- 27 Padgett 2014d.
- 28 Padgett 2014c.
- 29 So described at various websites, including www.psychologytoday.com/blog/sensorium/201404/struck-genius, written by Padgett's co-author on *Struck by Genius*. In some places on the web it is described as quantum snowfall.
- 30 www.struckbygenius.com.
- 31 Padgett 2014c.

32 Kastner 2017.

33 James 1909a (258).

34 James 1890, vol 1 (155).

35 Fossati, Hevenor, Graham *et al* 2003; Keenan, Gallup & Falk 2003; Kircher, Senior, Phillips *et al* 2001; Decety & Sommerville 2003; Mega & Cummings 2001.

36 Sherover 1989 (281).

37 Parfit 1984.

38 James 1909a (271–2: emphasis in original). One of James's eccentricities is spelling adjectives derived from proper names with a lower-case initial: I have preserved it here.

39 Bergson 1911a (ix).

40 Bergson 2007b (26).

41 James 1909a (253–4: emphasis in original).

42 Kierkegaard 1967 (148).

43 Bergson 2007b (24).

44 Bergson 2007a (16).

45 James 1909a (285: emphasis in original).

46 Simons 2018 (50).

47 Bohm 1980 (29).

48 James 1909a (261).

49 James 1909a (272–3).

50 James 1909a (258).

51 Lawrence 1992 (127–8: emphasis in original).

52 This is also in keeping with Pragmatism. Cf Rosenthal 1996: 'Pragmatic continuity can best be understood as having both unity and multiplicity' (559).

53 Schelling 1799a (30-1): » *Man denke sich einen Strom, derselbe ist reine Identität, wo er einem Widerstand begegnet, bildet sich ein Wirbel, dieser Wirbel ist nichts Feststehendes, sondern in jedem Augenblick Verschwindendes, in jedem Augenblick wieder Entstehendes. In der Natur ist ursprünglich nichts zu unterscheiden; noch sind gleichsam alle Producte aufgelöst und unsichtbar in der allgemeinen Productivität. Erst wenn die Hemmungspunkte gegeben sind, werden sie allmählich abgesetzt, und treten aus der allgemeinen Identität hervor. – An jedem solchen Punkt bricht sich der Strom (die Productivität wird vernichtet), aber in jedem Moment kommt eine neue Welle, welche die Sphäre erfüllt.* «

54 Schelling 2004, 'The unconditioned in nature': vol I, i (18: emphasis in original).

55 Schelling 1994 (116: emphasis in original).

56 Schelling 1799a (22): » *in der gemeinen Ansicht verschwindet [die ursprüngliche Productivität der Natur] über dem Product; in der philosophischen verschwindet umgekehrt das Product über der Productivität.* «

57 *ibid* (6): » *Philosophieren über die Natur heißt, sie aus dem toten Mechanismus, worinn sie befangen erscheint, herausheben, sie mit Freiheit gleichsam beleben und in eigne freie Entwicklung versetzen – heißt, mit andern Worten, sich selbst von der gemeinen Ansicht losreißen, welche in der Natur nur, was geschieht –höchstens das Handeln als Factum, nicht das Handeln selbst im Handeln – erblickt.* «

- 58** Schelling 2004, 'The unconditioned in nature': I, i (18).
- 59** See Bowie 2016.
- 60** See, for example, Schelling, 'Of the magnet': 1988 (122–7).
- 61** Schelling 2000 (2).
- 62** Schwenk 1976.
- 63** Royal Library (Windsor Castle): RL 12579r. As translated in Lugli 2016.
- 64** Bissell, Dall'Armellina & Choudhury 2014.
- 65** de Vries 2012 (311). Helical blood vessels permit a flow pattern that does not have stagnation points. The consequence of stagnation is atherosclerosis and, ultimately, death.
- 66** Tennekes & Lumley 1999 (1).
- 67** Borovik 2014 (32).
- 68** Tennekes *et al*, *op cit* (2).
- 69** Mullin 1989; Davidson 2004 (24).
- 70** Feynman, Leighton & Sands 1964.
- 71** Beal, Hover, Triantafyllou *et al* 2006.
- 72** Dabiri 2007.
- 73** Fish: Liao 2004: 'Comparisons with dead trout towed behind a cylinder confirm this intriguing observation that live trout may temporarily adopt the Kármán gait with no axial muscle activity, revealing paradoxically that at times fish can passively move against turbulent flow'. Swifts: Videler, Stamhuis & Povel 2004. Butterflies: Srygley & Thomas 2002. Basilisk lizards: Dvořák 2014. Jellyfish: Gemmell, Costello, Colin *et al* 2013. These principles were predicted by the work of Viktor Schauberger: see theartofnature.org/id20.html (a useful resource on the movement of fish, from which the illustration of trout movement is taken).
- 74** Tennekes *et al*, *op cit* (1–4).
- 75** Schelling 2004, 'The unconditioned in nature', I, i (18).
- 76** Bowie 2016.
- 77** Schelling 1994 (130).
- 78** Pieper 1990 (39).
- 79** Schopenhauer 2000, vol I (257).
- 80** Nietzsche 1889, 'Sprüche und Pfeile': §33: » *Ohne Musik wäre das Leben ein Irrthum. Der Deutsche denkt sich selbst Gott liedersingend* « .
- 81** Cioran 1989.
- 82** Langer 1942 (228).
- 83** de Sélincourt 1920: quoted in Langer *op cit* (110).
- 84** Bergson 2007e (124).
- 85** Langer 1953 (109–10: emphasis in original).
- 86** Harris & de Jong 2015.
- 87** Fuchs 2013.
- 88** Fuchs 2001.
- 89** Dewey, 'The philosophy of Whitehead': 1988 (135).

- 90** James 1909a (253).
- 91** Schelling 1798 (204–6).
- 92** Ball 2000 (148: emphasis added).
- 93** Franks 1972 (18).
- 94** Other examples would include decane and mercury.
- 95** Ball *op cit* (x).
- 96** *ibid* (168).
- 97** *ibid* (158: emphasis in original).
- 98** *ibid* (165: emphasis added).
- 99** *ibid* (154).
- 100** *ibid* (177).
- 101** Ball *op cit* (140–1).
- 102** *ibid* (143–4).
- 103** *ibid* (164).
- 104** *ibid*.
- 105** This concept is central to Taoism, and was originally applied to the markings in jade..
- 106** Needham 1954–98 (1956), vol 2 (558).
- 107** Watts 1975 (15).
- 108** Watts [undated].
- 109** Douthat, Nagib & Fejer 1975.
- 110** Watts 2006 (128). In Chinese philosophy, left and right have special significances, very much in line with the hemisphere hypothesis: see McGilchrist 2009b (457). That the *tao* is in both seems to me to relate to Schelling’s perception that the element of resistance to flow is part of the flow itself, a part that makes it what it is.
- 111** Eggert 1999.
- 112** Wade 2007, 8.
- 113** Whitehead 1919 (195): ‘An object is a pattern’.
- 114** Professional musicians are an exception: see discussion of evidence and possible cause in McGilchrist 2009b (75).
- 115** Alpherts, Vermeulen, Franken *et al* 2002.
- 116** Ben-Dov & Carmon, 1984.
- 117** Whitehead *op cit* (198: emphasis added).
- 118** Dekker, Crow, Folsom *et al* 2000.
- 119** *ibid* (197).
- 120** Whitehead 1929b (16–17).
- 121** See McGilchrist 2009b (387 & 509, n129). Since writing those words, more than one person has written to me to point out that light rays follow a straight path. I suppose if one were to be pedantic one would say that they follow what appear to be straight lines, but lines which in reality follow the curvature of space. However, accepting the point does not do much to negate the general truth.

122 It has been suggested that an analysis of ‘Hogarth curves’ shows that his preferred curve, number 4, embodies the Golden Ratio more closely than any of the others (Zhu, Luo, Huang *et al* 2018).

123 Alberti 2013 (67).

124 Herder 2002 (40: emphasis in original).

125 See note 3292 above.

126 Bergson 2007d (89).

127 Simplicius, *Commentary on Aristotle’s Physics*, Diels-Krantz A9.

128 Democritus, according to Diogenes Lærtius, *Lives of the Eminent Philosophers*, Bk IX, §45. For Anaxagoras, see fr 9 & 12; for Empedocles, see fr B35; for early Celtic & Teutonic, see McCormack 2012 (1).

129 Leibniz, letter to Antoine Arnauld, 30 April 1687 (emphasis in original).

130 Leibniz, letter to Bartholomew Des Bosses, 30 April 1709.

131 Bergson 1969 (11): « *Comment pourtant ne pas voir que l’essence de la durée est de couler, et que du stable accolé à du stable ne fera jamais rien qui dure?* »

132 Bergson 2007e (118).

133 *ibid* (130). This, the standard English version, has ‘this immobile substratum of immobility’, which seems wrong, and is. The original reads ‘*ce substrat immobile de la mobilité*’: Bergson 1911b (34).

134 Bergson 2007e (117).

135 Aristotle, *Physics*, III.1: 201a10–14.

136 Under the heading ‘Thought without words’, the letter was published in the issue for 12 May 1887, 36, 28–9; and a further response to Müller’s reply is dated 2 June 1887, 36, 101. Both are worth reading in their entirety, and can be accessed at archive.org/stream/naturejournal36londonoft#page/100.

137 This point is considerably elaborated in McGilchrist 2009b (esp in Chapter 3).

138 Galton refers to Binet’s work (incorrectly) as *Sur Le Raisonnement*.

139 Crawford 2015 (51).

140 Hauk, Johnsrude & Pulvermüller 2004. See also Barsalou 2008; Fischer & Zwaan 2008; Pulvermüller 2005; Jirak, Menz, Buccino *et al* 2010; Gallese 2008; Boulenger, Shtyrov & Pulvermüller 2012; Aziz-Zadeh & Damasio 2008; Cappa & Pulvermüller 2012.

141 Shebani & Pulvermüller 2013.

142 Eg, Kiefer, Sim, Herrnberger *et al* 2008; Barrós-Loscertales, González, Pulvermüller *et al* 2012; González, Barrós-Loscertales, Pulvermüller *et al* 2006. For review, see Moseley & Pulvermüller 2014.

143 Zwaan 2004.

144 Jeannerod 2006.

145 Bigio 2012; Bak 2013.

146 Brown, Lacomblez, Landwehrmeyer *et al* 2010; Bak 2010; Bak 2013.

147 Eg, Bak *supra*. See also Liepmann’s description of the (quite different) limb-kinetic apraxia, where jerkiness is not part of the clinical picture, but in which he observes the connexion between movement and imagination: ‘the person with damage to kinaesthetic concepts returns to the stage of one who has not yet learned a certain manipulation. Movements are influenced in a general way by

the ideational concept. He can move his limbs to an extent according to imagined paths, but there is a lack of fineness and certainty of movement, which is the result of practice ... the movement ... relates to the ideational concept or correct execution as a helpless copy relates to the original, the finer details of which are completely absent in the copy.' Lange 1988 (153–4), describing a patient of Westphal's (Westphal 1907).

148 Taylor, Brown, Tsermentseli *et al* 2013.

149 Bak, O'Donovan, Xuereb *et al* 2001.

150 Péran, Rascol, Démonet *et al* 2003; Boulenger, Mechtouff, Thobois *et al* 2008; Rodriguez-Ferreiro, Menéndez, Ribacoba *et al* 2009.

151 Daniele, Giustolisi, Silveri *et al* 1994.

152 Silveri & Ciccarelli 2007.

153 Bak, Yancopoulou, Nestor *et al* 2006.

154 Vico 1971 (505)/ 1948 (137). See also Denes & Dalla Barba 1998.

155 Vico: see Denes & Dalla Barba 1998, referring to Vico 1971 (137); Linnæus: Östberg 2003, referring to Linnæus 1745/1943 (trans in Viets 1943).

156 Bak & Chandran 2012.

157 Henery & Mayhew 1989.

158 Herculano-Houzel 2009.

159 Courchesne, Yeung-Courchesne, Press *et al* 1988; Bauman & Kemper 1985.

160 Muratori, Cesari & Casella 2001.

161 Tavano, Grasso, Gagliardi *et al* 2007; Schmahmann 2010.

162 Cook 2016.

163 Schmahmann *op cit*.

164 Schmahmann 1991.

165 Schmahmann 2010. I mentioned that in patients with motoneurone disease, there are problems with retrieving verbs of action: there is activation in the right posterolateral and midline cerebellum, which can be visualised on brain imaging, when subjects are asked to generate verbs for nouns, a process conventionally believed to be confined to 'lexical processing areas' of the neocortex (Fiez & Raichle 1997). See Vigliocco, Vinson, Druks *et al* 2011, for a sensible and comprehensive review of the separate debate about whether nouns and verbs are processed independently in the brain.

166 Ivry & Keele 1989

167 Schmahmann *op cit*.

168 *ibid*.

169 Tavano, Grasso, Gagliardi *et al* 2007.

170 Combettes 1831.

171 Velioğlu, Kuzeyli & Özmenoğlu 1998; Yu, Jiang, Sun *et al* 2015; Gelal, Kalaycı, Çelebisoy *et al* 2016.

172 Botez-Marquard & Botez 1993.

173 Schmahmann *op cit*.

174 Prescott 1970.

175 Schmahmann 1991.

- 176** Schmahmann 2010.
- 177** *ibid.*
- 178** Schmahmann & Pandya 2008.
- 179** McGilchrist 2009b (225–56).
- 180** McGilchrist 2009b (225).
- 181** Cutting & Silzer 1990.
- 182** McGhie & Chapman 1961 (emphasis added).
- 183** Sass & Pienkos 2013c.
- 184** Jaspers 1963 (82: emphasis added).
- 185** Patient quoted by Minkowski 1970 (279).
- 186** Fuchs 2013 (emphasis added).
- 187** Kim, Takemoto, Mayahara *et al* 1994 (433).
- 188** Sass & Pienkos 2013b (103–30).
- 189** Minkowski 1987 (206).
- 190** Cook, Blakemore & Press 2013; and see Kretschmer *op cit.* As also discussed in Chapter 9.
- 191** Shiffrar 2011; Cook 2016.
- 192** Kim, Park & Blake 2011.
- 193** Chen, Nakayama, Levy *et al* 2003.
- 194** Kim *et al* 1994 *op cit* (432).
- 195** Slepian, Weisbuch, Pauker 2014; Slepian & Ambady 2012.
- 196** McGhie & Chapman 1961 (106).
- 197** Minkowski 1987 (200).
- 198** Kretschmer 1925 (174 & 175).
- 199** *ibid* (175).
- 200** *ibid* (147).
- 201** *ibid* (176–7).
- 202** *ibid* (134).
- 203** Lin, Chuah, Mohan *et al* 2011.
- 204** Kanner 1943; Kanner 1968; Asperger 1944.
- 205** Nobile, Perego, Piccinini *et al* 2011.
- 206** Eg, Ghaziuddin & Butler 1998; Jansiewicz, Goldberg, Newschaffer *et al* 2006; Noterdaeme, Mildenerger, Minow 2002; Rinehart, Tonge, Iansek *et al* 2006.
- 207** See note 3893 above.
- 208** Eg, Blackman 1999; Hale & Hale 1999; Williams 1996, 1999 & 2003.
- 209** Judy Endow (Facebook, 25 January 2009), quoted in Donnellan, Hill & Leary 2013 (emphasis added).
- 210** Han, Bi, Chen *et al* 2013.
- 211** Allison, Puce & McCarthy 2000; Grossman, Battelli & Pascual-Leone 2005; van Kemenade, Muggleton, Walsh *et al* 2012; Hein & Knight 2008; Redcay 2008; Carrington & Bailey 2009.

- 212** Grossman, Battelli & Pascual-Leone 2005; van Kemenade, Muggleton, Walsh *et al* 2012.
- 213** Lee, Gao & McCarthy 2014; Shultz, Lee, Pelphrey *et al* 2011; Saxe, Xiao, Kovacs *et al* 2004; Pelphrey, Singerman, Allison *et al* 2003; Shultz & McCarthy 2012; Shultz & McCarthy 2014; Pelphrey, Morris & McCarthy 2004.
- 214** Puce, Allison, Gore *et al* 1995; Haxby, Horwitz, Ungerleider *et al* 1994; Kanwisher, McDermott & Chun 1997; Sergent, Ohta & MacDonald 1992.
- 215** de Vito, Lunven, Bourlon *et al* 2015.
- 216** Chen, Novak & Manor 2014; Titianova & Tarkka 1995; Cassvan, Ross, Dyer *et al* 1976; Pérennou, Benaim, Rouget *et al* 1999; Pérennou 2006; Pérennou, Mazibrada, Chauvineau *et al* 2008; Genthon, Rougier, Gissot *et al* 2008.
- 217** Coslett & Heilman 1989 (274); see also Heilman & van den Abell 1979.
- 218** Cutting 2018. Note that Scheler's reduction is quite different from that developed by Husserl, which according to Cutting, 'was merely a judgement, on Husserl's part, of what a human being would experience of some object (an apple tree in blossom being his example) if the reality of the actual object were "bracketed"'.
- 219** Scheler 2008 (78).
- 220** Cutting & Musalek 2016 (emphasis added).
- 221** van der Merwe & Voestermans 1995.
- 222** Hamilton, Wolpert & Frith 2004.
- 223** Jacobs & Shiffrar 2005.
- 224** Wohlschläger 2000; Brass, Bekkering & Prinz 2001.
- 225** Pobric & Hamilton 2006.
- 226** Buxbaum, Kyle & Menon 2005; Pazzaglia, Smania, Corato *et al* 2008; Negri, Rumiat, Zadini *et al* 2007.
- 227** I explore the intersubjective and embodied nature of perception in McGilchrist 2009b (esp 161–9 & 265–6). For a book-length examination of the topic, the reader is referred to Claxton 2016.
- 228** Dewey 1896 (358–9).
- 229** Llinás 2001 (58–9).
- 230** I am indebted to Barbara Goodrich's interesting paper (2010) from which this quotation, and these examples, are taken.
- 231** Buzsáki 2006 (ix & 30).
- 232** *ibid* (228).
- 233** O'Regan & Noë 2001.
- 234** Nietzsche 1889, 'Sprüche und Pfeile': §34: » *Damit habe ich dich, Nihilist! Das Sitzfleisch ist gerade die Sünde wider den heiligen Geist. Nur die ergangenen Gedanken haben Wert* « (emphasis in original).
- 235** See McGilchrist 2009b (111–26 *et passim*). On syntax, see Vowles 1970.
- 236** Schelling 1856–61a (208): » *Die Bewegung ist aber das Wesentliche der Wissenschaft; diesem Lebenselement entnommen, sterben sie ab, wie Früchte vom lebendigen Baum getrennt.* «
- 237** Ellis & Newton 2012.
- 238** Merleau-Ponty 1962 (137). Merleau-Ponty 1945 (134–5): « *mon corps m'apparaît comme posture en vue d'une certaine tâche actuelle ou possible* ».

239 James 2008 (83).

240 Singh 1987 (10).

241 Bergson 1912 (50–1).

242 Elias 1991 (33–4: emphasis in original): “‘Reason”, “mind”, “consciousness” or “ego” ... all give the impression of substances rather than functions, of something at rest rather than in motion ... [Yet] they are functions which – unlike those of the stomach or bones, for example – are directed constantly towards *other* people and things’.

243 Schelling 1799b (5): » *Das Seyn selbst = absoluter Thätigkeit* « (emphasis in original).

244 Bergson 2007e (119).

245 *ibid* (emphasis in original).

246 Leibniz, letter to Antoine Arnauld, early November 1671. Cf Kolakowski 1985 (14–15): ‘The moving arrow never *is* at any certain point, and we can understand this easily if, instead of starting with space, we take the fact of movement as the original, irreducible reality’.

247 Hegel 1969 (440).

248 Smolin 2013 (30).

249 I am grateful to John Cutting for drawing my attention to the fact that Scheler said just this: see Scheler 1973, 288–356 (esp 331, 333 & 341).

250 Levin 1999 (37).

251 From Cutting 2002 (161). I am indebted to Cutting’s account of the patient (160–2). The account is taken from Kuhn 1952.

252 Ronchi 2014 (132).

253 Bergson 2007c (160: emphasis in original).

254 Bergson 2007b (22).

255 James 1909a (236).

256 trans D Jenkins & Y Moriguchi.

257 Suzuki 2011.

24. SPACE AND MATTER

1 Eddington 1928 (291: emphasis in original).

2 Newton 1687.

3 Zwicky 2014b, §73: emphasis in original).

4 Tong 2012.

5 Cf McGinn 1995, for whom consciousness ‘seems not to be the *kind of thing* that falls under spatial predicates. It falls under temporal predicates ...but it resists being cast as a regular inhabitant of the space we see around us and within which the material world has its existence’ (220: emphasis in original).

6 Scheler 2008 (300–1).

7 Whitehead 1938 (139–40).

8 See Chapter 12.

9 Schrödinger 1951 (21: emphasis in original).

10 Some of my thinking here was influenced by the work of the mycologist, Alan Rayner: see Rayner 2017. Incidentally, at first glance, this is the opposite of the way in which the origins of the world are expressed according to the creation myth in Genesis, where it is written that ‘the earth was without form, and void; and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters.’ But what was real at that stage was the Spirit of God, and the world was merely a receptive space (‘void’) without any identity: it was the creative force of the Spirit of God that brought form to it, and thereby brought it into being. So for what it is worth, there seems to me to be no contradiction here.

11 Lu & Chiang 2007 (344).

12 Gao & Lan 2018 (237).

13 Watson 2014.

14 Gao & Lan 2018 (237).

15 James 1911b (xii–xiii).

16 See, eg, Thompson 1992 (16).

17 For an interesting sidelight on the relationship between the structure of DNA and the golden ratio, see Chen, Huang & Sun 2014.

18 Galilei 1623.

19 Whitehead 1938 (195).

20 Berlin 1999 (102–4).

21 James 1909a (250 & 252).

22 Tillich 1958.

23 Canning [undated].

24 Fletcher 2001 (369).

25 *Tao Te Ching*, §11 (translation untraced).

26 Poincaré 1913a (28: emphasis added).

- [27](#) Mikulecky 2000 (419).
- [28](#) Mermin 1998.
- [29](#) Hut [undated].
- [30](#) Mermin 1998.
- [31](#) *ibid.*
- [32](#) Durnford & Kimura 1971; Nikolaenko & Egorov 1998.
- [33](#) Maguire, Gadian, Johnsrude *et al* 2000; Abrahams, Pickering, Polkey *et al* 1997; Burgess, Maguire & O’Keefe 2002; Iglói, Doeller, Berthoz *et al* 2010; Maguire, Frackowiak & Frith 1997; Bohbot, Jech, Růžicka *et al* 2002; Squire, Ojemann, Miezin *et al* 1992.
- [34](#) Specifically, gamma oscillations: Jacobs, Korolev, Caplan *et al* 2010.
- [35](#) Belmonti, Berthoz, Cioni *et al* 2015.
- [36](#) Dieterich & Brandt 2018.
- [37](#) Palermo, Ranieri, Boccia *et al* 2012.
- [38](#) Brunyé, Holmes, Cantelon *et al* 2014.
- [39](#) Banich & Federmeier 1999; Hellige & Michimata 1989; Kosslyn, Koenig, Barrett *et al* 1989; Laeng 1994; Rybash & Hoyer 1992; Baumann, Chan & Mattingley 2012.
- [40](#) Kosslyn 1987; Kinsbourne 1993 (6).
- [41](#) See McGilchrist 2009b (60, 64, 77–9, 181–3, 447); and, eg, Liotti & Tucker 1994; and Ross, Homan & Buck 1994.
- [42](#) The case of a Mexican artist has been reported in detail (Orjuela-Rojas, Sosa-Ortiz, Díaz-Victoria *et al* 2017). After resection of a neurocytoma that affected the right thalamo-parietal connexions, he suffered an impairment of the ability to create perspective in his paintings and omitted shapes only on the left side of his paintings. Before the procedure, his paintings evinced ‘a play of light and shadow’: he achieved the representation of a complex volume using different depths of shading, and suggesting a light source coming from the right side of the picture. For example, in a landscape painting ‘each shape is associated with a shadow that depends on the position of the light source. This is the case with the rock in the foreground, the house, and the mountains, creating not only three dimensionality but also giving credibility to the painting ... [After the procedure there was] no efficient perspective, the brush stroke is loose and imprecise, there are no figurative details (birds, trees, flowers, clouds) in the left space, but distribution of colour throughout the work remains. There is no strong light source; thus, the figures, including the tree that casts no shadow, lack volume ... The origin of light is ambiguous throughout the image, constantly *changing in an arbitrary way*’ (emphasis added). This is the difference between a real, unique, embodied view and a ‘view from nowhere’, which, as discussed both in this book and *The Master and his Emissary*, is remarkably like the view taken, both literally and metaphorically, by the left hemisphere.
- [43](#) Yomogida, Sugiura, Watanabe *et al* 2004.
- [44](#) Laeng, Shah & Kosslyn 1999; Zaidel & Kasher 1989.
- [45](#) Cutting 1997 (162–3); Wexler 1986.
- [46](#) Landau, Gleitman & Spelke 1981.
- [47](#) Chiron, Jambaque, Nabbout *et al* 1997.
- [48](#) Poincaré 1913a (29).
- [49](#) McGinn 1995 (230).
- [50](#) Sass 2017 (270).

- 51** Kantrowitz, Butler, Schechter *et al* 2009; Schechter, Butler, Jalbrzikowski *et al* 2006; Phillipson & Harris 1985.
- 52** Chapman 1966 (230).
- 53** Murata 1998 (298), referring to Merleau-Ponty 1969.
- 54** Fischer 1930a (244–5): » *Der Raum bedrängt mich. Er ist für mich nicht da ... Das mangelnde ‚Raumgefühl‘, die Engigkeit der Augenblicke* « (emphasis added).
- 55** Tatossian 2014a (78).
- 56** *ibid* (76).
- 57** Jaspers 1963 (81).
- 58** *ibid*.
- 59** Kimura 1994 (194): » *Wenn ich in einen Spiegel sehe, weiss ich nicht mehr, ob ich hier mich dort im Spiegel sehe oder ich dort im Spiegel mich hier sehe. Stehe ich zwischen zwei Spiegeln, dann entsteht eine unendliche Kette des Mich-selbst-sehens, was mich verwirrt. Sehe ich einen anderen im Spiegel, so vermag ich ihn nicht mehr von mir zu unterscheiden. In einem schlechteren Befinden geht auch der Unterschied zwischen mir selbst und einem wirklichen anderen verloren. Im Fernsehen weiss ich nicht mehr, ob ich dort im Fernsehapparat spreche oder das Gesprochene hier höre. Ich weiss nicht, ob sich das Innere nach aussen kehrt oder das Äussere nach innen. Mir kommt es vor, wie wenn der Boden meines Seins untergeht. Ob es nicht zwei Ichs gibt?* «
- 60** Dietz, Friston, Mattingley *et al* 2014.
- 61** McGhie & Chapman 1961 (105).
- 62** *ibid*.
- 63** Knight, Manoach, Elliott *et al* 2000; Silverstein, Bakshi, Chapman *et al* 1998.
- 64** Minkowski 1987 (207).
- 65** *ibid* (208).
- 66** Autism: Perreault, Gurnsey, Dawson *et al* 2011; OCD: Evans, Orr, Lazar *et al* 2012; Mataix-Cols, Nakatani, Micali *et al* 2008; Silverstein, Matteson & Knight 1996; AN: Matsunaga, Kiriike, Iwasaki *et al* 1999; Matsunaga, Miyata, Iwasaki *et al* 1999.
- 67** Private communication from the patient.
- 68** Right thalamus and right insula in OCD: Gilbert, Akkal, Almeida *et al* 2009; right parietal lobe and right prefrontal cortex in AN: Suda, Brooks, Giampietro *et al* 2014.
- 69** Aaronson 1967 (247).
- 70** *ibid* (249–50).
- 71** *ibid* (251).
- 72** *ibid* (247 & 249).
- 73** *ibid* (249).
- 74** *ibid* (251: emphasis added).
- 75** See Chapter 9.
- 76** Heidegger 1975c (164).
- 77** Gombrich 1960 (112). According to Vitruvius, Agatharchus wrote a treatise on perspective in the fifth century BC: see Vitruvius, 1914, intro to Bk VII (198).
- 78** Greenberg 1960.
- 79** Jelinek 1983 (102: emphasis added).

80 Cf Octavio Paz, from ‘The Consecration of the Instant’: ‘What characterizes the poem is its necessary dependence on the word as much as its struggle to transcend it.’ Quoted in Zwicky 2014a, §108b.

81 McGilchrist 2009b (414–6).

82 Rode, Vallar, Chabanat *et al* 2018.

83 As quoted in Petersen 1963 (12).

84 As quoted in Jammer 1974 (161: emphasis in original). Cf Smolin 2013 (81): ‘We can manipulate quantum particles in experiments and talk about how they respond to being measured. But we cannot visualise what goes on in the absence of our manipulation of nature.’

85 Tong 2012.

86 Tong *op cit*.

87 Conversation recorded in Heisenberg 1971, “‘Understanding” in modern physics’: 27–42 (41: emphasis added). It is widely cited incorrectly as from ‘Discussions about language (1933)’.

88 Frank 1958 (60).

89 James 1911b (xii–xiii).

90 Tong 2012.

91 Tong 2016.

92 Smolin 2013 (81).

93 Joseph Needham, the great historian of science in China, comments that ‘atomism in the physico-chemical sense never played any role of importance in traditional Chinese scientific thinking, which was wedded to the ideas of the continuum and action at a distance’: 1969 (224).

94 Tong 2012.

95 Tong 2016.

96 Tong 2012.

97 The theorem referred to is the Nielsen-Ninomiya theorem: Tong 2012.

98 Brooks 2016 (location 371).

99 Brooks *op cit* (location 2593).

100 Musser 2018.

101 Green 2014.

102 Frank 1958 (64).

103 Wilczek 2008 (236).

104 Brooks 2016 (location 262: emphasis added).

105 Hobson 2007 (312).

106 Brooks 2016 (location 1881).

107 Life is bound up with energy fields that emit light. ‘Organisms and tissues spontaneously emit measurable intensities of light, ie photons in the visible part of the electromagnetic spectrum (380–780 nm), in the range from 1 to 1,000 photons per second per square centimetre, depending on their condition and vitality. It is important not to confuse ultraweak photon emission from living systems with other biogenic light-emitting processes such as bioluminescence or chemiluminescence ... Ultraweak photon emission also supports the understanding of life sustaining processes as basically driven by electromagnetic fields’ (Schwabl & Klima 2005).

108 Cf Schopenhauer 1974, vol 1 (99): ‘Matter is that which persists and endures’.

- 109** Brooks 2016 (location 2748).
- 110** Bohm 1986 (44).
- 111** Peirce 1931–60, vol 6, §227 (emphasis added).
- 112** Brooks 2016 (location 1732).
- 113** Pais 1982 (289 & 463).
- 114** Pauli 1954 (14).
- 115** Brooks 2016 (location 1259–78: emphasis in original).
- 116** Manning, Khakimov, Dall *et al* 2015; Ma, Kofler, Qarry *et al* 2013.
- 117** Mermin 1998. John Bell took the view that the word ‘measurement’ had had ‘such a damaging effect on the discussion, that I think it should now be banned altogether in quantum mechanics’ (Bell 2004, 216).
- 118** Mermin *op cit*.
- 119** Wilczek 2008 (84 & 89: emphasis added).
- 120** Bohm 1980 (191).
- 121** Oerter 2006 (218).
- 122** Brooks 2016 (location 2738).
- 123** Musser 2018 (emphasis added).
- 124** Gleiser 2014 (233).
- 125** Chalmers 1995. See Ringbauer, Duffus, Branciard *et al* 2015; Ma, Zotter, Kofler *et al* 2012; Megidish, Halevy, Shacham *et al* 2013; Lemos, Borish, Cole *et al* 2014.
- 126** Shi, Kumar & Lee 2017.
- 127** Bohr 1961 (56–7).
- 128** Bohm 1980 (29).
- 129** Einstein 1971 (244).
- 130** Gleiser 2014 (168).
- 131** Tong 2016.
- 132** Bergson 1911c (280).
- 133** Gunter 1969 (45).
- 134** Gleiser 2014 (249).
- 135** Pasteur 1874; in Vallery-Radot 1922, vol 1 (361, 375 & 377): « *L’univers est un ensemble dissymétrique et je suis persuadé que la vie, telle qu’elle se manifeste à nous, est fonction de la dissymétrie de l’univers ... Sans nul doute, je le répète, si les principes immédiats de la vie sont dissymétriques, c’est que, à leur élaboration, président des forces cosmiques dissymétriques ... La vie est dominée par des actions dissymétriques dont nous pressentons l’existence enveloppante et cosmique. Je pressens même que toutes les espèces vivantes sont primordialement, dans leur structure, dans leurs formes extérieures, des fonctions de la dissymétrie cosmique.* »
- 136** Li & Bowerman 2010.
- 137** Klar 2002.
- 138** See Niklas 1988; and Valladares & Brites 2004.
- 139** Stewart 2018.
- 140** *ibid*.

141 Close 2000 (152).

142 Brooks 2016. Fermions (one of the two basic classes of particles, which includes, among others, electrons, protons, neutrons, neutrinos and quarks) that spin in a counter-clockwise direction feel the weak nuclear force, and those that spin in a clockwise direction do not.

143 Tong 2012.

144 One mechanism for this is that neuronal receptors have built-in chirality, and when a drug is designed to 'lock on' to a receptor and activate it, the wrong enantiomer may block the receptor, but without activating it. This is somewhat like the way in which the wrong key, if it is like enough to the one that opens the lock, may jam the lock and prevent it from opening. This probably explains why, for example, the S (or left-hand) enantiomer, escitalopram, is a much more effective antidepressant than the racemic drug, citalopram.

145 Polkinghorne 2008.

146 See, eg, Theise & Kafatos 2016.

147 Pierre & Hübler 1994; Wotherspoon & Hübler 2009; Bilder & Knudsen 2014; Korn & Faure 2003.

148 Anderson 1972 (394).

149 Heisenberg 1971, 'Atomic physics and Pragmatism': 93–102 (101).

25. MATTER AND CONSCIOUSNESS

- 1 James 1890, vol 1 (134).
- 2 Lawrence, 'We are transmitters'.
- 3 Nagel 2012 (53).
- 4 Ho 1994 (189).
- 5 Schiller 1891 (297–8).
- 6 Sherrington 2009 (312). Cf James 1890 (as in note 4116 above).
- 7 This area is well covered by, eg, Zeman 2004.
- 8 Bargh 1997 (243).
- 9 James 1902 (388). Often misquoted as 'flimsiest' of screens.
- 10 Hopkins 1963 (145–6).
- 11 Letter of Pauli to Léon Rosenfeld, 16 April 1952; in von Meyenn 1996 (610–11).
- 12 Schiller 1929 (197–8).
- 13 Whitehead 1911 (61).
- 14 James 1890, vol 2 (496).
- 15 Baumeister, Masicampo & Vohs 2011 (336).
- 16 See Chapters 17–19. Also de Neys 2006.
- 17 Frith & Metzinger 2016; Samson, Apperly, Braithwaite *et al* 2010.
- 18 See, eg, Dijksterhuis, Bos, Nordgren *et al* 2006; Dijksterhuis & Nordgren 2006; Levine, Halberstadt & Goldstone 1996; Engel & Singer 2008.
- 19 Strawson 2006 (4). Cf James 1897, 'The will to believe': 1–31 (15): 'There is but one indefectibly certain truth, and that is the truth that pyrrhonistic scepticism itself leaves standing, – the truth that the present phenomenon of consciousness exists'.
- 20 Strawson 2008 (55).
- 21 Strawson 2013.
- 22 Strawson 2008 (55).
- 23 Schrödinger 1984 (334).
- 24 Strawson 2013.
- 25 Strawson 2006 (18).
- 26 De Quincey 2010.
- 27 Such ideas are hardly confined to Eastern traditions: see Skrbina (2017) for a scholarly and detailed account of the long tradition of such ideas in Western thinking.
- 28 Strawson 2008 (54).
- 29 Strawson 2006 (13 & 18).
- 30 Cf Nagel 2012 (56): 'Harmless emergence is splendidly illustrated by the example of liquidity, which depends on the interactions of the molecules that compose the liquid. But the emergence of the

mental at certain levels of biological complexity is not like this. According to the emergent position now being considered, consciousness is something completely new.’

31 Strawson 2006 (18).

32 Haldane 1932 (113).

33 James 1890, vol 1 (148–9: emphases in original).

34 Newton 2001 (48: emphasis in original).

35 McGinn 1993 (60).

36 Stent 1968 (395).

37 Sherrington 2009 (354 & 266: emphasis added). Cf Waddington 1961 (121): ‘Are we not forced to conclude that even in the simplest inanimate things there is something which belongs to the same realm of being as self-awareness?’

38 Ramachandran & Blakemore 2001 (176).

39 Heisenberg 1958 (95).

40 As recorded in Heisenberg 1971, ‘The relationship between biology, physics and chemistry’: 103–16 (114).

41 von Neumann 1955b (418).

42 Frank 2017.

43 Bohr 1961 (18).

44 Bell 2004 (217).

45 Bohr 1961 (56–7).

46 Schiller 1891 (69).

47 *ibid* (272).

48 *ibid* (271).

49 Frank 2017.

50 Davies 2006.

51 Strawson 2013.

52 Schopenhauer 1974, vol I (99).

53 Frank 2017.

54 Whitehead 1938 (214).

55 Wigner 1967 (172).

56 von Weizsäcker 1980 (250).

57 Schopenhauer 2000, vol II (15–16).

58 Letter of Pauli to Abraham Pais, 17 August 1950; in von Meyenn 1996 (152): » *Meine persönliche Ansicht ist die, daß in einer zukünftigen Wissenschaft die Realität weder ‚psychisch‘ noch ‚physisch‘ sein wird, sondern irgendwie beides und irgendwie keines von Beiden.* «

59 Pauli 1952 (164).

60 Wheeler 1963 (30).

61 Pauli 1955 (208 & 210).

62 Pauli 1950 (79) (trans H Atmanspacher & H Primas).

63 Atmanspacher & Primas 2006 (21).

64 Rosenfeld 1963 (47).

65 Strawson 2008 (8).

66 Heisenberg 1958 (75).

67 Planck 1932 (95).

68 Jeans 1934.

69 Letter of Pauli to CG Jung, 23 December 1947; in Meier 2001 (32–3).

70 Frauchiger & Renner 2018; Ananthaswamy 2018.

71 Peres 2005 (514).

72 McGinn 1995.

73 Schrödinger 1967a (122): ‘We are faced with the following remarkable situation. While the stuff from which our world picture is built is yielded exclusively from the sense organs as organs of the mind, so that every man’s world picture is and always remains a construct of his mind and cannot be proved to have any other existence, yet the conscious mind itself remains a stranger within that construct, it has no living space in it, you can spot it nowhere in space. We do not usually realise this fact, because we have entirely taken to thinking of the personality of a human being, or for that matter also that of an animal, as located in the interior of its body. To learn that it cannot really be found there is so amazing that it meets with doubt and hesitation, we are very loath to admit it’.

74 *ibid* (121).

75 Planck 1931a. A revealing story: I found this missing from Max Planck’s Wikiquote page. Looking up the editorial discussion page (en.wikiquote.org/wiki/Talk:Max_Planck), I found the following: ‘Dear Editors and Readers, I have removed the following citation [there follows this quote *verbatim*]. Rational [*sic*]: I checked this citation in its source – that is, on page 17 in the January 25, 1931 issue of the newspaper *The Observer* in the article entitled “Interviews with Great Scientists – VI. – Max Planck”, in the digital archive of *The Guardian and Observer*, and this citation has proved to be false ... The file I attached to my letters contains a detailed reasoning.’ However, another reader wrote: ‘Dear all. I took the liberty of double checking in *The Observer*, 25 January, 1931, p.17 ...The interview by J. W. N. Sullivan does indeed include the said quote, *verbatim*, in the second column! (Copy available on request.) I therefore request that the quote be reinstated on the page...’ It had not been reinstated. I checked for myself and found the quotation, *verbatim*, just where the previous commentator had described, except that it was in column 3. I therefore reinstated it.

76 Planck 1944: » *Als Physiker, also als Mann, der sein ganzes Leben der nüchternen Wissenschaft, nämlich der Erforschung der Materie diene, bin ich sicher frei davon, für einen Schwarmgeist gehalten zu werden. Und so sage ich Ihnen nach meiner Erforschung des Atoms dieses: Es gibt keine Materie an sich! Alle Materie entsteht und besteht nur durch eine Kraft, welche die Atomteilchen in Schwingung bringt und sie zum winzigsten Sonnensystem des Atoms zusammenhält ... so müssen wir hinter dieser Kraft einen bewussten, intelligenten Geist annehmen.* «

77 Wigner 1961/1983 (169).

78 Ho 1994 (181).

79 Eddington 1928 (276–7: emphasis added).

80 *ibid* (280 & 281).

81 Jeans 1930 (137).

82 Penrose & Clark 1994 (17–24).

83 Henry 2005.

84 Henry & Palmquist 2007 (emphasis in the original).

- 85** Haisch 2006 (137).
- 86** Henry 2008; referring to Gröblacher, Paterek, Kaltenbaek *et al* 2007 (emphasis in the original). See more recently, eg, Manning, Khakimov, Dall *et al* 2015.
- 87** Planck 1960 (53).
- 88** Eddington 1920 (200–1).
- 89** Stapp 2017 (9).
- 90** Wheeler 1990 (5).
- 91** Bohr 1961 (119: emphasis added).
- 92** Stapp 2017 (x).
- 93** Wheeler 1973, as quoted in Chandos 2015.
- 94** Wheeler 2006.
- 95** Goethe 1988 (39): » *Jeder neue Gegenstand, wohl beschaut, schließt ein neues Organ in uns auf* «.
- 96** Theise 2005; Theise 2006; Kurakin 2011.
- 97** Theise & Kafatos 2016.
- 98** See McGilchrist 2009b (181–2).
- 99** Nietzsche 2003b (73).
- 100** Dyson 1979 (248).
- 101** Skrbina 2017 (256).
- 102** Stapp 2017 (13).
- 103** Strawson 2006 (25).
- 104** Heraclitus fr XXXI [Diels 13, Marcovich 23d]: ξυνόν ἐστι πᾶσι τὸ φρονέειν (trans IMcG).
- 105** Heraclitus fr XXXV [Diels 45, Marcovich 67]: this is the interpretation offered by Kahn in his commentary (Kahn 1979, 129).
- 106** Kahn 1979 (128).
- 107** Heraclitus fr XL [Diels 90, Marcovich 54].
- 108** Heraclitus fr XXXV [Diels 45, Marcovich 67] (trans IMcG).
- 109** Empedocles [Diels 31.B 110] as at Barnes 1987 (163).
- 110** See Nisbet 1970 (11); also Skrbina 2017 (113).
- 111** Schopenhauer 2004 (212).
- 112** *ibid* (212–3). Hollingdale has ‘dead, ie completely passive material void of all qualities’. I have added punctuation to make it easier to read.
- 113** *ibid* (213).
- 114** Russell 1927 (307).
- 115** *ibid* (163).
- 116** Russell *op cit* (209, 306 & 311).
- 117** Huxley 1942 (141).
- 118** Huxley 1959a (16).
- 119** Marryat 1836 (20).
- 120** Skrbina 2017 (249–50).

- 121** Bohm 1957 (163).
- 122** Stapp 2017 (6: emphasis in original).
- 123** Whitehead 1920 (29: emphasis added).
- 124** Goethe, ‘Allerdings: dem Physiker’, lines 15–17.
- 125** Baker & Hacker 2005 (30).
- 126** Whitehead 1920 (30).
- 127** Whitehead 1929b (69).
- 128** Stapp 2007 (2).
- 129** Letter of Jung to Oscar Hug, 24 May 1938; in Adler & Jaffé 1973, vol I (246).
- 130** Whitehead, 1929a (17). This issue was discussed in Chapter 12, and will be further discussed in Chapter 27.
- 131** Lipton 2005 (7).
- 132** *ibid.*
- 133** Shapiro 2011 (7).
- 134** Ford 2017 (280–5).
- 135** Part of the variance in numbers is due to differences in methodology, and part to do with sex differences – ‘the total glial cell numbers were 27.9 billion in females and 38.9 billion in males, and the total number of neocortical neurons 21.4 billion in females and 26.3 billion in males [a 22% increase], providing a total neuron and glial cell number of 49.3 billion for females and 65.2 billion for males [a 32% increase]’: Pelvig, Pakkenberg, Stark *et al* 2008; ‘this region [medial temporal lobe] showed 34 % more neurons in men than in women: 525.1 million against 347.4 million’: Oliveira-Pinto, Andrade-Moraes, Oliveira *et al* 2016. (Strictly speaking this is not correct: it shows, for this brain region, 34% fewer neurons in women than in men, 51% more neurons in men than women.) Interestingly, treatment of female-to-male sex change patients with testosterone causes increase, and treatment of male-to-female sex change patients with oestrogen and anti-androgens causes decrease, in cortical thickness across the brain (Zubiaurre-Elorza, Junque, Gómez-Gil *et al* 2014; Pol, Cohen-Kettenis, van Haren *et al* 2006). The lower overall estimates of 16 and 69 billion come from Suzana Herculano-Houzel’s research group: Azevedo, Carvalho, Grinberg *et al* 2009. The higher estimates are more usual in most other sources both before and since Herculano-Houzel’s study: eg, Carassiti, Altmann, Petrova *et al* 2018; Pelvig, Pakkenberg, Stark *et al* 2008; Andersen, Korbo & Pakkenberg 1992.
- 136** Herndon 1963.
- 137** Litwin-Kumar, Harris, Axel *et al* 2017.
- 138** Rabinowicz, de Courten-Myers, Petetot *et al* 1996.
- 139** Harris 2019 (38: emphasis in original).
- 140** See esp, Panksepp 2007.
- 141** Lewin 1980 (1232).
- 142** Shewmon, Holmes & Byrne 1999.
- 143** Baars, Ramsøy & Laureys 2003; Sporns, Tononi & Edelman 2000.
- 144** Merker 2007.
- 145** See, eg, Alcantara & Monk 1974.
- 146** Pfeffer 1873 & Pfeffer 1900.

- 147** Holmes & Gruenberg 1965: as cited by Abramson & Chicas-Mosier 2016.
- 148** Gagliano, Renton, Depczynski *et al* 2014. I am grateful to Rebecca Hosking for drawing this body of research to my attention.
- 149** *ibid.*
- 150** Gagliano, Vyazovskiy, Borbély *et al* 2016.
- 151** Karpiński & Szechyńska-Hebda 2010.
- 152** See, eg, Trewavas 2003; Thellier & Lüttge 2013.
- 153** Jaillais & Chory 2010.
- 154** Marder 2012.
- 155** Trewavas 2003.
- 156** Marder *op cit.*
- 157** Gagliano, Renton, Depczynski *et al* 2014 (69). See also Chamovitz (2012a).
- 158** Gagliano *et al*, *op cit* (64).
- 159** Marder 2012; Paré & Tumlinson 1999.
- 160** Chamovitz 2012a.
- 161** Livni 2018.
- 162** Szechyńska-Hebda, Kruk, Górecka *et al* 2010. Quoted by Marder *op cit.*
- 163** Marder 2013.
- 164** Baluška, Mancuso, Volkmann *et al* 2009.
- 165** Marder *op cit.*
- 166** *ibid.*
- 167** Geddes 2021. The research report is: Raja, Silva, Holghoomi *et al* 2020.
- 168** Marder 2012.
- 169** Gagliano, Mancuso & Robert 2012.
- 170** Gagliano, Grimonprez, Depczynski *et al* 2017.
- 171** Baluška, Mancuso, Volkmann *et al* 2009.
- 172** Darwin 1880 (573). Cf Charles Darwin in a letter to Asa Gray of 22 October 1872: ‘The point which has interested me most is tracing the *nerves!* which follow the vascular bundles. By a prick with a sharp lancet at a certain point, I can paralyse one-half the leaf, so that a stimulus to the other half causes no movement. It is just like dividing the spinal marrow of a frog: – no stimulus can be sent from the brain or anterior part of the spine to the hind legs; but if these latter are stimulated, they move by reflex action. I find my old results about the astonishing sensitiveness of the nervous system (!?) of *Drosera* to various stimulants fully confirmed and extended’: Darwin 1887, vol III (322: emphasis in original).
- 173** Darwin 1880 (558). Circumnutation can now be seen with the help of time-lapse photography: eg, www.youtube.com/watch?v=nmIYAX6Tw6w.
- 174** Marder 2012.
- 175** Falik, Mordoch, Quansah *et al* 2011.
- 176** Livni 2018.
- 177** *ibid.*

178 For an insight into some of those who don't, see an opinion piece by Lincoln Taiz and colleagues in *Trends in Plant Science*, which states that 'there is no evidence that plants require, and thus have evolved, energy-expensive mental faculties, such as consciousness, feelings, and intentionality, to survive or to reproduce' (Taiz, Alkon, Draguhn *et al* 2019). Of course this already makes numerous questionable assumptions. Taiz told *The Guardian* newspaper: 'Our criticism of the plant neurobiologists is they have failed to consider the importance of brain organisation, complexity and specialisation for the phenomenon of consciousness.' That, too, makes unnecessary assumptions. But most importantly it fails to do justice to much of the material in this chapter suggesting that, whatever our theory may dictate, the relationship between brains and consciousness is not transparent at all. As Monica Gagliano responded, 'If we think we already know how things are and fail to continuously question our own assumptions, but construct our claims on a system of beliefs we are dearly attached to, then we are in deep trouble and miss the opportunity for true scientific discovery to occur ... Miserably, this opinion piece seems yet another missed opportunity, one that makes strikingly no headway towards a better scientific understanding of what consciousness is' (Sample 2019).

179 See Tudge 2006; and Wohlleben 2017.

180 Simard 2016.

181 Livni 2018.

182 Chamovitz 2012b (68–9).

183 Baluška, Mancuso, Volkmann *et al* 2009.

184 Gagliano, Renton, Depczynski *et al* 2014 (69–70).

185 Lipton 2005 (81).

186 *ibid* (100).

187 Darwin 1881 (98).

188 Godfrey-Smith 2018 (94): referring to Sneddon 2011.

189 *ibid* (95).

190 *ibid* (92–5).

191 *ibid* (97).

192 *ibid* (100).

193 Howard, Avarguès-Weber, Garcia *et al* 2019; Rodríguez, Briceño, Briceño-Aguilar *et al* 2015; Nelson & Jackson 2012.

194 Marzluff, Miyaoka, Minoshima *et al* 2012; Gruber, Schiestl, Boeckle *et al* 2019; Taylor, Elliffe, Hunt *et al* 2010.

195 Kabadayi & Osvath 2017.

196 Güntürkün & Bugnyar 2016; Jarvis, Güntürkün, Bruce *et al* 2005.

197 Olkowicz, Kocourek, Lučan *et al* 2016.

198 Güntürkün, Ströckens, Scarf *et al* 2017.

199 Letzner, Güntürkün & Beste 2017.

200 Wright, Magnotti, Katz *et al* 2017.

201 Darwin 1871, vol I (145).

202 Letter of Descartes to Marin Mersenne, 11 June 1640: in Descartes 1984–91, vol 3 (148).

203 Anand & Hickey 1987.

204 McGraw 1941: ‘it is reasonable to assume that the sensori-motor reactions of the newborn infant do not extend appreciably beyond the level of the thalamus.’

205 Chamberlain 1991.

206 Goksan, Hartley, Emery *et al* 2015.

207 Brenner 1997.

208 Johnson 2018. On Posner molecules, see: Swift, van de Walle & Fisher 2018.

209 Fisher 2015.

210 Johnson *op cit*.

211 ‘Consciousness does not mechanically cause the wave function to collapse or influence physical particles. Rather, the observer’s brain and the observed system are synchronously entangled’ (Wallace 2007, 82).

212 Stapp 2017 (1–2).

213 Stapp 2009 (242).

214 Noble [undated].

215 Stapp 2017 (13).

216 Lambert, Chen, Cheng *et al* 2013.

217 Albrecht & Phillips 2014. I am grateful to Professor David Anthony Oliver for bringing this paper to my attention.

218 ‘Process 1 first selects, from the Process-2-generated continuum of potentialities, a particular perception that ‘might’ occur. Then ‘nature’ chooses, subject to the statistical Born Rule, either to accept the possibility selected by the observer, and then actualize the global consequences of that acceptance, or actualize the global consequences of rejecting the observer’s proposal’ (Stapp 2017, 24).

219 Stapp 2017 (13).

220 Stapp 2009 (23).

221 Stapp 2017 (12).

222 An intriguing theory developed by Jonathan Schooler, Professor of Psychological and Brain Sciences at the University of California, Santa Barbara, and Tam Hunt, a philosopher of mind at the UCSB’s Department of Brain and Cognitive Sciences, builds on the non-controversial idea that matter and energy are oscillating fields, and indeed that all existing things, however static they may seem, are ‘just vibrations of various underlying fields’. Hunt (2018) points to the fact that these oscillations and vibrations are entrained – come into ‘synch’ – in closely coupled entities: he gives the examples of light emissions from neighbouring fireflies, neuronal firing, and the rotation of the moon in relation to its orbit. He and Schooler propose what they call a ‘resonance theory of consciousness’, adopting a panpsychist position, and positing that ‘particular linkages that allow for macro-consciousness to occur result from a shared resonance among many micro-conscious constituents’. This thesis is consonant with Sheldrake’s idea of morphogenetic fields.

223 Schiller 1891 (71–2: emphasis in the original).

224 Musser 2015 (139).

225 For an overview of the phenomenon in practice, see Brown 2013.

226 Geuter, Koban & Wager 2017; Požgain, Požgain & Degmečić 2014.

227 Ikemi & Nakagawa 1962. The paper reports in detail a study of suggestion in 57 boys aged between 15 and 18 who were touched with a leaf of ‘lacquer tree’ or ‘wax tree’, which are both

known to cause contact dermatitis, on one arm, and with a chestnut tree, which is non-allergenic, on the other. Amongst a sub-group of 13 that were known to have had previous marked reactions to the poisonous leaves, subjects hypnotised to believe the harmless leaf was poisonous, and the poisonous leaf was harmless, in every case produced a clear reaction to the harmless leaf, and in only one case a reaction to the poisonous leaf. This study is difficult to replicate for ethical reasons, but needs replication. A highly sceptical review of reported cases up to 1963 concludes that, ‘even though the majority of these reports are grossly lacking in controls, experimental design, etc, and are subject to alternative explanations, the author concludes that skin anomalies have been produced by suggestion in some instances. Additional studies of psychogenic vascular changes add credence to the possibility of central control of these phenomena’ (Paul 1963).

228 Shenefelt 2017.

229 Druckman & Swets 1988 (esp 61–70).

230 See, eg, Butler, Chapman, Forman *et al* 2006.

231 See, eg, Porto, Oliveira, Mari *et al* 2009; Yang, Oathes, Linn *et al* 2017; and Collerton 2013.

232 Strasburger & Waldvogel 2015. As an aside, there are elevated levels of perfusion in the left temporal lobe in such dissociative identity disorders: Schlumpf, Reinders, Nijenhuis *et al* 2014. In a detailed study of two cases of multiple personality disorder, both ‘were in a state of relative left hemisphere [EEG] activation across all cerebral regions and task conditions’: Flor-Henry, Tomer, Kumpula *et al* 1990.

233 Ducasse 2006.

234 Beauregard, Trent & Schwartz 2018. See also Cardeña, Lynn & Krippner 2017. Certain particular findings stand out: the capacity for intention to influence non-living systems, as determined by Radin, Michel & Delorme 2016; the possibility of verifiable detailed vision of some kind in blind subjects, including the congenitally blind (hence my rider, ‘of some kind’), during near-death and out-of-body experiences, as reported in an impressively balanced assessment of the evidence by Ring & Cooper 1997 (both Ring & Cooper and Beauregard *et al* dispose convincingly of the suggestion that NDEs are merely a side-effect of hypoxia, hypercarbia or another brain distress state); prescience, as determined by Mossbridge, Tressoldi & Utts 2012.

235 Nuñez 1995 (158).

236 Baumeister, Masicampo & Vohs 2011 (331).

237 Maoz, Rutishauser, Kim *et al* 2013. See also Gholipour 2019.

238 Trevena & Miller 2010.

239 Herrmann, Pauen, Min *et al* 2008.

240 Roland, Larsen, Lassen *et al* 1980; Desmurget, Reilly, Richard *et al* 2009. For an excellent brief overview, on which I have drawn here, see Taylor 2019.

241 Kornhuber & Deecke 1965.

242 See, eg, Radin 2018 (ch 6).

243 Baumeister, Masicampo & Vohs 2011 (333). For a useful discussion of the fallacies of ‘willusionism’, see Mele 2009.

244 Nuñez 2010 (274).

245 Strawson 2006 (7).

246 Blake, *The Marriage of Heaven and Hell*, Plate 6, ‘A memorable fancy’.

247 Lipton 2005 (60).

248 *ibid* (58).

- 249** James 1992 (1110).
- 250** James 1890, vol 1 (288).
- 251** Schiller 1891 (295: emphasis in original).
- 252** *ibid* (295–6).
- 253** Bergson 1920 (77).
- 254** Freedman, Binns, Gao *et al* 2018.
- 255** Urgesi, Aglioti, Skrap *et al* 2010.
- 256** Kastrup 2014 (esp 42–50).
- 257** Peres, Moreira-Almeida, Caixeta *et al* 2012.
- 258** Nahm, Greyson, Kelly *et al* 2012. In another study 100% of cases died within nine days: Lim, Park, Kim *et al* 2018.
- 259** Greyson 2019.
- 260** Nahm *et al*, *op cit*; Lim *et al*, *op cit*; Nahm & Greyson 2009.
- 261** Macleod 2009; Nahm & Greyson 2009.
- 262** For a detailed overview, see Holden, Greyson & James 2009.
- 263** Greyson 2019.
- 264** Fenwick, Lovelace & Brayne 2007; Lim *et al*, *op cit*.
- 265** Brayne, Lovelace & Fenwick 2008. See also Fenwick, Lovelace & Brayne 2010; and Macleod 2009.
- 266** Bergson 1920 (71: emphasis added).
- 267** Schiller 1891 (295–6).
- 268** Penfield & Perot 1963: examples include: (a) ‘It was like being in a dance hall, like standing in the doorway – in a gymnasium – like at the Kenwood Highschool ... If I wanted to go there it would be similar to what I heard just now’; (b) ‘Some crazy things ran through my mind; I was younger, at school. I was playing with a polo bat.’ When asked, he said he remembers doing this when going to school at about the age of 10; (c) ‘Oh, I had the same very, very familiar memory in an office somewhere. I could see the desks. I was there and someone was calling to me, a man leaning on a desk with a pencil in his hand’; (d) ‘I feel as though I was in the bathroom at school’; (e) She had heard ‘Frankie and the neighbourhood noises’. She was asked whether it seemed to her to be a memory and she replied, ‘Oh no, it seemed more real than that.’ She thought she was looking into the yard and saw as well as heard the boy; (f) ‘I hear my brother talking.’ When asked what he was saying, she said he was talking to one of his schoolmates; (g) While the electrode was held in place the patient said, ‘Something brings back a memory, I could see Seven-Up Bottling Company – Harrison Bakery.’
- 269** Such might be the case of Franco Magnani, memorialised by Oliver Sacks (1992); or of ‘HK’, who suffered a serious haemorrhage as a neonate, which left him blind, but with almost total autobiographical recall (Ally, Hussey & Donahue 2013). It is thought possible that deficits in the left temporal lobe may underlie the condition, as it may other savant syndromes: ‘the anatomic substrate for the savant syndrome may involve loss of function in the left temporal lobe with enhanced function of the posterior neocortex’ (Hou, Miller, Cummings *et al* 2000). Interestingly the original ‘Rain Man’ was able to read extremely rapidly, simultaneously scanning one page with the left eye and the other page with the right eye: he had no corpus callosum (Treffert 2009). Cf the case of CS Peirce, who reportedly could simultaneously write a question with one hand and answer it with the other (see Stigler 1992 [63]).

270 See, eg, Chrysikou, Weber & Thompson-Schill 2014; and Shimamura 2000.

271 ‘The first phase selects a possible next subjective perception on the part of the observer. This ‘possible/potential’ next perception defines a corresponding brain correlate, which has, according to the theory, a certain statistical weight. The second phase of Process 1 then reduces the material universe to two parts, one that definitely contains this brain correlate and the other that definitely does not contain this brain correlate, and it “actualises” either one part or the other. This choice made by nature between the two parts accords with a certain statistical rule known as the “Born Rule”. This Born-Rule choice is the (unique) place where “an element of chance” enters into the quantum dynamics. The preceding choice of a possible next perception reflects the history and the felt values of the observer, and is identified with what the observer feels is his or her personal subjective choice of what physical property of the observed system to probe or inquire about. No element of chance is ascribed to this choice made by an observer of a particular possible probing action’ (Stapp 2017, 8).

272 Strawson 2013. This is highly reminiscent of an equally vibrant passage in another philosopher, Bryan Magee: ‘Ordinary human beings not engaged in philosophizing take it for granted that a so-called material object is the sum total of its observable characteristics. If you say to someone, ‘How do you know I am holding a leather glove in my hand?’ he might well say with impatience, ‘Well, don’t be silly. I can see it. And here’ – reaching out ‘I can touch it and feel it. And’ – taking it and raising it to his nose – ‘I can tell from the smell that it’s leather.’ And so on and so forth. And when he had gone through every attribute of the glove that was accessible to his senses he would think there was nothing left he could say about it. It would not normally occur to him to suppose that the real glove, the glove-in-itself, was an invisible, ineffable substratum that was for ever inaccessible to his observations even though it sustained the incidental characteristics he observed. He would, on the contrary, take the glove to *be* the sum of the characteristics he could observe’ (Magee 1998a, 123–4).

273 Lakoff & Johnson 1999 (93: emphasis in original).

274 Ho 1994 (182).

275 See, eg, Theise & Kafatos 2016.

276 Hoffman 2016.

277 Bergson 1912 (65: emphasis in original).

278 della Mirandola 1956 (4).

279 McGilchrist 2009b (197: for more detail, 197ff & 230–1).

280 Bowie 2016.

281 Stapp 2007 (20: emphasis in original).

282 Huxley 1959b (236).

283 Teilhard de Chardin 1959 (221: emphasis in original).

284 Bohm 2002 (389).

285 Nagel 2012 (85).

286 Deutsch 2006.

287 Segall 2018.

288 Nagel 2012 (56).

289 *ibid* (57).

290 Bohm 1982 (39).

291 Letter of Einstein to Leo Szilard, 12 July 1947; as at Clark 1984 (34–5: emphasis added).

292 Rosen 2000 (7).

- 293** *ibid* (20).
- 294** Oliver 2019 (4).
- 295** Rosen *op cit* (36: emphasis in original).
- 296** *ibid* (37: emphasis in original).
- 297** Peirce 1955 (339).
- 298** Whitehead 1929b (11).
- 299** Cf Bergson 2007f (74): ‘Why must we speak of an inert matter into which life and consciousness would be inserted, as in a frame? By what right do we put the inert first?’
- 300** Bohm 1980 (175).
- 301** Whitehead 1926b (129).
- 302** Rosen 2000 (33–4). See also Waddington 1961 (121): ‘something must go on in the simplest inanimate things which can be described in the same language as would be used to describe our self-awareness.’
- 303** Schelling, ‘The unconditioned in nature’: 2004, I, i (17).
- 304** Diderot 1875 (138–40): « *Tout est en un flux perpétuel ... Tout animal est plus ou moins homme; tout minéral est plus ou moins plante; toute plante est plus ou moins animal. Il n’y a rien de précis en nature ... Chaque forme a le bonheur et le malheur qui lui est propre. Depuis l’éléphant jusqu’au puceron ... depuis le puceron jusqu’à la molécule sensible et vivante, l’origine de tout, pas un point dans la nature entière qui ne souffre ou qui ne jouisse.* »
- 305** Nagel 2012 (95, n9).
- 306** Schelling 1988 (34).
- 307** *ibid* (37); in Gare 2011.
- 308** Nagel *op cit* (95).
- 309** Spelke 1976.
- 310** Tononi & Koch 2015.
- 311** Koch 2004 (287–94).
- 312** Wald 1984.
- 313** Wald 1989.
- 314** *ibid* (emphasis in original).
- 315** Letter of Einstein to Robert Marcus of the World Jewish Congress, who had recently lost a son, 12 February 1950 (retranslated from his handwritten draft): » *Ein Mensch ist ein räumlich und zeitlich beschränktes Stück des Ganzen, was wir ‚Universum‘ nennen. Er erlebt sich und sein Fühlen als abgetrennt gegenüber dem Rest, eine optische Täuschung seines Bewusstseins.* «
- 316** Bohm 2002 (386).
- 317** Schrödinger 1967b (89).
- 318** James 1909b (589).
- 319** James 1909a (292).
- 320** Abram 2011.
- 321** Letter of Martin Heidegger to Hannah Arendt, 21 February 1925; in Ludz 2004 (4–5).
- 322** Schrödinger 1964 (22).
- 323** Wordsworth 1876, vol II (122).

- 324** Bohm 1980 (xi).
- 325** *ibid* (xi–xiv).
- 326** Heisenberg 1971, ‘Elementary particles and Platonic philosophy’: 237–47 (246).
- 327** Plotinus, *Enneads*, Bk II, Tractate III, §7 (trans AH Armstrong).
- 328** Pauli 1961 (15–16): » *Dieser Sachverhalt der Komplementarität innerhalb der Physik führt in natürlicher Weise über das engere Gebiet der Physik hinaus zu analogen Situationen bei den allgemeinen Bedingungen der menschlichen Erkenntnis ... In der Tat hat die Beziehung zwischen Subjekt und Objekt paradoxe Eigenschaften, die eine weitgehende Analogie zu Beziehung zwischen Beobachtungsmittel und beobachtetem System haben, wie wir ihr in der Quantenphysik begegnen.* «
- 329** Bohr 1933 (emphasis added). A version of this paper had been published in Bohr 2011 (3–12). I have drawn on both versions.
- 330** Bohr 1961 (99–100).
- 331** Planck 1936 (31–3).
- 332** Heisenberg 1958 (155).
- 333** Jeans 1942 (200, 202 & 204).
- 334** From Brooks 2016 (location 1896).
- 335** de Broglie 1939 (217–8).
- 336** *ibid* (281–2).
- 337** Tononi & Koch 2015.
- 338** Theise & Kafatos 2016.
- 339** James 1890, vol 1 (206).
- 340** Bergson 1911a (342–3).
- 341** Eddington 1939 (104).
- 342** See Heisenberg 1971, ‘Elementary particles and Platonic philosophy’: 237–47 (244).
- 343** *ibid*.
- 344** Manzotti & Parks 2020 (21).
- 345** Sass 2017 (280).
- 346** Stanghellini 2004.
- 347** Laing 1990 (49).
- 348** As Joseph Needham’s monumental *Science and Civilisation in China*, and Stephen Gaukroger’s *The Emergence of a Scientific Culture: Science and the Shaping of Modernity, 1210–1685*, make evident.
- 349** Mormann, Dubois, Kornblith *et al* 2011; Yang, Bellgowan & Martin 2012; Martin & Weisberg 2003; Castelli, Happé, Frith *et al* 2000.
- 350** Smolin 1999 (44–5).
- 351** See Rees 2015.
- 352** Hawking 1989 (126). This quote is *not* to suggest that Hawking himself favoured fine-tuning – he didn’t; but that was because he believed apparent fine-tuning could be explained by inflation. That hypothesis, in turn, is far from straightforward, however. ‘The difference between good and bad [inflation] hinges on the precise shape of the potential energy curve, which is controlled by a numerical parameter that could, in principle, take on any value whatsoever. Only an extremely narrow range of values could produce the observed temperature variation. In a typical inflationary

model, the value must be near 10⁻¹⁵ – that is, zero to 15 decimal places. A less fine-tuned choice, such as zero to only 12 or 10 or eight decimal places, would produce bad inflation: the same degree of accelerated expansion (or more) but with a large temperature variation that is inconsistent with observations ... Both sets of configurations are rare, so obtaining a flat universe is unlikely overall. Penrose’s shocking conclusion, though, was that obtaining a flat universe without inflation is much more likely than with inflation – by a factor of 10 to the googol (10¹⁰⁰) power! ... In 2008 Gary W. Gibbons of the University of Cambridge and Neil G. Turok of the Perimeter Institute for Theoretical Physics in Ontario showed that an overwhelming number of extrapolations have insignificant amounts of inflation. This conclusion is consistent with Penrose’s. Both seem counterintuitive because a flat and smooth universe is unlikely, and inflation is a powerful mechanism for obtaining the needed smoothing and flattening. Yet this advantage appears to be completely offset by the fact that the conditions for starting inflation are so improbable. When all factors are taken into account, the universe is more likely to have achieved its current conditions without inflation than with it ... [In inflation] rogue regions spawn new rogue regions, as well as new islands of matter – each a self-contained universe. The process continues ad infinitum, creating an unbounded number of islands surrounded by ever more inflating space. If you are not disturbed by this picture, don’t worry – you should not be. The disturbing news comes next ... In an eternally inflating universe, an infinite number of islands will have properties like the ones we observe, but an infinite number will not. The true outcome of inflation was best summarized by Guth: “In an eternally inflating universe, anything that can happen will happen; in fact, it will happen an infinite number of times.”... What does it mean to say that inflation makes certain predictions – that, for example, the universe is uniform or has scale-invariant fluctuations – if anything that can happen will happen an infinite number of times? And if the theory does not make testable predictions, how can cosmologists claim that the theory agrees with observations, as they routinely do? ... The oft-cited claim that cosmological data have verified the central predictions of inflationary theory is misleading, at best ... Highly improbable conditions are required to start inflation. Worse, inflation goes on eternally, producing infinitely many outcomes, so the theory makes no firm observational predictions’ (Steinhardt 2011).

353 Oberhummer, Csótó & Schlattl 2000.

354 Hoyle 1982 (16).

355 Davies 1988 (203).

356 Einstein 1999 (29).

357 Wilczek 2006.

358 Letter of Pauli to Niels Bohr, 15 February 1955; in Meyenn 2001 (105). And he continued with a shrewd observation: ‘I found for instance H.J. Muller very characteristic for this school of biologists (see also his recent article ‘Life’ in “Science”, issue of January 7, 1955, which certainly contains very interesting material), but also our friend Max Delbrück. With him this is combined with vehement emotional affects and a permanent threat to run away which I interpret as obvious signs of overcompensated doubts.’

359 Davies 1983 (174).

360 Barnes 2011 (559: emphasis in original).

361 For intrinsic unverifiability, see Ellis 2011. For a detailed cosmological examination of the multiverse claim and its coherence or otherwise, see Lewis & Barnes 2016; and Barnes 2011. Barnes shows that all proposed alternatives to ‘fine-tuning’ in the accepted sense require fine-tuning of their own, and to a similar extent.

362 Hilbert 1984 (201).

363 Ellis, Kirchner & Stoeger 2004.

364 Stoeger, Ellis & Kirchner 2004.

365 Steinhardt 2011.

366 Gardner 2003 (9).

367 Tegmark 2003.

368 Ball 2018.

369 *ibid.*

370 Kimura 1994 (194): » *Wenn man irgend etwas erkennt, dort verzweigt es sich; in diesem Augenblick wird die Welt entzweigerissen ... Ich glaube, dass es auch andere Ichs wahrscheinlichkeitsmässig gibt.* «

371 A further sidelight on this comes from David Mermin's model, in which there are only correlations – no correlata. He quotes Christopher Fuchs, Professor of Physics at Boston, as suggesting that the distinction between the 'many worlds interpretation' and the 'correlations without correlata' position of Mermin is 'most succinctly expressed by characterizing many worlds as correlata without correlations' (Mermin 1998). In other words, all betweenness, or configuration of the *Gestalt*, with no entities to be fixed, in the first case; and all fixed entities, but no betweenness, or *Gestalt*, arising in the second. This too reflects the difference between right hemisphere and left hemisphere takes on reality, respectively.

372 Magee 1998a (98).

373 (Emphasis added).

374 Matlack 2017.

375 James 1902 (73: emphasis in original).

376 Strawson 2006 (28).

377 Gleiser 2014 (193).

26. VALUE

- 1 Wigner, as quoted in Dyson 2004 (294).
- 2 Muir 1915 (5).
- 3 Dickinson, fr 1455 (in the Harvard *variorum* edition).
- 4 Nagel 2012 (123).
- 5 The kabbalists regarded elements such as will, wisdom, love, and compassion, which form part of the sefirot, not simply as aspects of the human mind but as ‘the very elements of the world itself’ (Drob 1997).
- 6 Theise & Kafatos 2016 (emphasis added).
- 7 Steane 2018 (139).
- 8 ‘The author Philip Pullman, one of Dawkins’s friends, recalled a discussion the two once had about what you might tell a terminally ill child about death. Dawkins “was very unwilling, or seemed to be, to say that it would be OK at that point to tell a fairytale about heaven”, Pullman said’ (Elmhirst 2015).
- 9 Patmore, ‘Magna est veritas’.
- 10 Dickinson, fr 836 ((in the Harvard *variorum* edition).
- 11 Lessing 1979 (trans HB Garland 1937: 171).
- 12 Narayan, Narr, Kumari *et al* 2007.
- 13 Scheler 1992, ‘Love and knowledge’ (147). The quote comes from Goethe’s letter to Friedrich Heinrich Jacobi, 10 May 1812: » *Man lernt nichts kennen, als was man liebt, und je tiefer und vollständiger die Kenntniß werden soll, desto stärker, kräftiger und lebendiger muß Liebe, ja Leidenschaft seyn.* «
- 14 Emerson, ‘Journal C’, entry for 10 April 1837: 1965 (294).
- 15 Cf Polkinghorne (2008): ‘Faith involves an act of commitment, but that commitment is motivated; it is a leap into the light and not into the dark’.
- 16 Freud to Oskar Pfister, letter of 21 June 1920: in Freud 1961 (330–1).
- 17 Ferenczi, diary entry, 4 August 1932; in Dupont 1995 (185–6).
- 18 Schwarzschild 1948 (194).
- 19 *ibid* (297): Engels, letter to Karl Marx, 3 December 1851.
- 20 Letter from Darwin to WD Fox, 24 October 1852; in Darwin 1887, vol I (384–5).
- 21 Kawasaki 1992, quoted by Ogawa 1998 (153).
- 22 Pascal 1964: « *au lieu qu’en parlant des choses humaines on dit qu’il faut les connaître avant que de les aimer, ce qui a passé en proverbe, les saints au contraire disent en parlant des choses divines qu’il faut les aimer pour les connaître, et qu’on n’entre dans la vérité que par la charité ...* ».
- 23 Augustine, *Contra Faustum*, Bk XXXII, ch xviii: ‘*Non intratur in veritatem nisi per caritatem.*’
- 24 Anselm, *Proslogion*, ch 1.
- 25 Nietzsche 1974b §334 (262: emphases in original).
- 26 *ibid*.

- [27](#) Fromm 1994 (193).
- [28](#) Scheler, *Ordo Amoris*: 1973 (110–1). See also Maria Scheler 1957.
- [29](#) Scheler 1992, ‘Love and knowledge’ (147). Cf Pascal 1910 (425): ‘Let us not therefore exclude reason from love, since they are inseparable. The poets were not right in painting Love blind; we must take off his bandage and restore to him henceforth the enjoyment of his eye’.
- [30](#) Heiti 2018 (273).
- [31](#) See Zajonc, Pietromonaco & Bargh 1982; and Zajonc 1984. See also McGilchrist 2009b (184–6 & 491, nn26 & 29).
- [32](#) Scheler 1916 (13): » *Sein Wert schreitet ihm gleichsam voran; er ist der erste ‚Bote‘ seiner besonderen Natur. Wo er selbst noch undeutlich und unklar ist, kann jener bereits deutlich und klar sein. Bei jeder Milieuerfassung erfassen wir z.B. zugleich zunächst das unanalyisierte Ganze und an diesem ganzen seinen Wert* «.
- [33](#) Cusinato 2012 (140ff): » *Der Wert ist also das, was das Phänomen verkündet und der weiteren Entwicklung seines Ausdrucks Richtung gibt. Die Wertnuancen eines Gegenstandes sind das Primäre, was von ihm auf uns zukommt, und gleichsam das Medium, in dem das Bild und die Bedeutung des Objekts aufgehen und sich kundtun.* «
- [34](#) Bergson 2007e (112).
- [35](#) Scheler 1960 (86).
- [36](#) Tsakiris, Costantini & Haggard 2008.
- [37](#) Farrer, Franck, Georgieff *et al* 2003; Chaminade & Decety 2002; Karnath & Baier 2010.
- [38](#) See note 4546 below.
- [39](#) Koenigs, Young, Adolphs *et al* 2007 (in this study the orbitofrontal lesions were, as one might expect, more right-sided, though that is apparent only on inspecting the scan data).
- [40](#) Anderson, Barrash & Bechara 2006.
- [41](#) Martins, Faísca, Esteves *et al* 2012.
- [42](#) Tranel, Bechara & Denburg 2002; Young, Cushman, Adolphs *et al* 2006; Mendez & Shapira 2009; Demaree, Everhart, Youngstorm *et al* 2005; Martins *et al*, *op cit*.
- [43](#) Miller, Sinnott-Armstrong, Young *et al* 2010.
- [44](#) Eslinger 1998; Gazzaniga, Ivry & Mangun 2008; Greene & Haidt 2002; Mendez & Shapira 2009.
- [45](#) Koenigs, Young, Adolphs *et al* 2007. In this study the orbitofrontal lesions were, as one might expect, more right-sided, though that is apparent only by inspecting the scan data.
- [46](#) Cushman, Gray, Gaffey *et al* 2012.
- [47](#) Choe & Min 2011.
- [48](#) Wiech, Kahane, Shackel *et al* 2013.
- [49](#) Bartels & Pizarro 2011.
- [50](#) Koenigs, Kruepke, Zeier *et al* 2012.
- [51](#) McGuire, Langdon & Brüne 2014; Johnson 1960.
- [52](#) Adolphs 2001; Adolphs, Baron-Cohen & Tranel 2002; Damasio, Grabowski, Bechara *et al* 2000; Eslinger 1998.
- [53](#) Bartels & Pizarro 2011.
- [54](#) Kahane, Everett, Earp *et al* 2015 (200, 206).
- [55](#) *ibid* (207).

[56](#) Deci 1971; Ariely, Gneezy & Loewenstein, 2009; Lepper, Greene & Nisbett 1973.

[57](#) McGee & Foster, forthcoming.

[58](#) A perhaps apocryphal story has an old lady approach William James after a lecture on cosmology and put forward her view that the world rests on the back of a turtle. When James politely enquired what the turtle rested on, she rebuked him: ‘You can’t catch me out that easily, you know, Professor James – it’s turtles all the way down’. But there are many versions based on the same idea, which derives from an obvious question prompted by ancient Indian cosmology.

[59](#) Cf Vygotsky 1986 (252): ‘Behind every thought there is an affective-volitional tendency, which holds the answer to the last “why” in the analysis of thinking’.

[60](#) McGee & Foster, forthcoming.

[61](#) Hecht 2014.

[62](#) Vohs & Schooler 2008; Baumeister, Masicampo & DeWall 2009; Stillman, Baumeister, Vohs *et al* 2010; Vohs & Baumeister 2009.

[63](#) Eckhart, ‘Of the value of resignation: what to do inwardly and outwardly’, *The Talks of Instruction*, §4, 2009 (489).

[64](#) MC Escher, ‘Drawing Hands’ (1948): see McGilchrist 2009b (134).

[65](#) Huxley 1893 (192–3).

[66](#) Desmond A, entry for Huxley in the *Oxford Dictionary of National Biography*, 2004.

[67](#) Huxley 2015 (25).

[68](#) Baumeister, Vohs, Aaker *et al* 2013.

[69](#) Their bodies go into threat mode, activating a stress-related gene pattern that leads to an increase in the activity of pro-inflammatory genes and a decrease in the activity of genes involved in anti-viral responses: Fredrickson, Grewen, Coffey *et al* 2013; but see Coyne 2013, and a reply to Coyne: Cole & Fredrickson 2013.

[70](#) Jung 1962 (75).

[71](#) Baumeister 2005.

[72](#) Foster 2009 (11).

[73](#) Foster cites these wise words of Lord Justice Hoffman: ‘there is no morally correct solution which can be deduced from a single ethical principle like the sanctity of life or the right of self-determination. There must be an accommodation between principles, both of which seem rational and good, but which have come into conflict with each other’: *Airedale NHS Trust v Bland* [1993] AC 789, 827 (Hoffman LJ). On the narrowness of Western morality compared with that of other countries, see Jonathan Haidt (2013).

[74](#) Masserman, Wechkin & Terris 1964.

[75](#) Masserman 1960.

[76](#) See Tudge 2013 (121–3).

[77](#) Rand, Greene & Nowak 2012.

[78](#) Zaki & Mitchell 2013.

[79](#) Tudge *op cit* (99: emphasis in original).

[80](#) Hamilton 2010.

[81](#) Greene & Paxton 2009 (12509).

[82](#) Stove 2006 (115–6).

83 Chen, Lam, Wu *et al* 2016; Everson, Kauhanen, Kaplan *et al* 1997; Haukkala & Uutela 2000; Smith 1992; Stavrova & Ehlebracht 2016.

84 Solon 2014; Mortensen, Barefoot & Avlund 2012; Barnes, De Leon, Bienias *et al* 2009; Carl 2014; Carl & Billari 2014; Hooghe, Marien & de Vroome 2012; Oskarsson, Dawes, Johannesson *et al* 2012; Sturgis, Read & Allum 2010. However, it may be that ‘those individuals whose personalities include such dark traits as Machiavellianism, narcissism, and psychopathy are neither brute dullards nor evil geniuses on average’ (O’Boyle, Forsyth, Banks *et al* 2013).

85 Haukkala 2002; Stavrova & Ehlebracht 2018.

86 Fetchenhauer & Dunning 2010.

87 Stavrova & Ehlebracht 2016.

88 Stavrova & Ehlebracht 2019; Wilson, Near & Miller 1996.

89 James 1897, ‘The moral philosopher and the moral life’: 184–215 (184).

90 Misselbrook 2015; referring to Rawls 1971.

91 Beauchamp & Childress 1979.

92 Sartre 1963 (213).

93 Kretschmer 1925 (163).

94 Tudge 2013 (234–5).

95 Grossmann, Brienza & Bobocel 2017.

96 Darwin 1872 (162 & 414).

97 For a useful and clear, if limited, discussion, see Welsch 2004.

98 See, eg, Greer 2003.

99 Eucherius (c 428 AD), *De laude eremi*, §38.

100 Pelly 2016.

101 Lawrence 1950 (14).

102 Social worker Susanne Sklar writes: ‘I was not surprised when impoverished single mothers in the slums of Tijuana, Mexico told an American foundation that what they most wanted for their undernourished and ill-clad children was a school that was beautiful’ (Sklar 2007).

103 *A History of the World in 100 Objects*, programme 3, BBC Radio 4, 2010.

104 Forbes 1971 (10).

105 Hallpike 2008 (195).

106 Hallpike 2011 (150: emphasis in original).

107 It seems to me that this is due mainly to a loss of the sense of harmonic proportion. My choice of date refers to Britain, the first nation to industrialise: this may coincide with the date at which the first builders and designers brought up entirely in an industrialised urban society there began to influence architecture and artefacts. My sense is that, since the process of industrialisation began in other nations a little later, the birth of ugliness in other parts of the world may have been correspondingly delayed slightly. It is also worth noting that the Georgian period (that preceded this date in Britain) is particularly recognised for its beautiful architecture and artefacts, so the effect is stark. Naturally I do not intend to imply anything so absurd as that all beauty disappeared from design: just that inadvertent ugliness in design made its first significant appearance at around this point in history, and grew.

108 According to Kluge’s *Etymological Dictionary of the German Language*, the word *Gestalt* may be derived from the compound Old High German word *ungistalt* (Middle High German *ungestalt*),

meaning ‘disfigured.’ Thus the *Gestalt* is what is lost when something is ugly. I am not in a position to pass philological judgment, but I like that.

109 Kant 1987, sect I, Bk I, iii, §17, *Akademie*, vol 5 (236).

110 Kant 1987, sect I, Bk I, i, §5, *Akademie*, vol 5 (209–10: emphasis in original).

111 Leibniz 1996, Bk II, ch xx, §5 (163).

112 Burke 1887, vol 1 (166).

113 Marcus Aurelius, *Meditations*, Bk IV, §20.

114 Seneca, *On the Happy Life*, IX, 4: ‘*virtus ipsa pretium sui*’; Spinoza, *Ethics*, V, §42: ‘*beatitudo non est virtutis præmium, sed ipsa virtus*’.

115 de Tommaso, Sardaro & Livrea 2008.

116 Dickinson, fr 516 (in the Harvard *variorum* edition).

117 Rilke, *Duino Elegien*, Erste Elegie: » *Denn das Schöne ist nichts / als des Schrecklichen Anfang, den wir noch grade ertragen, / und wir bewundern es so, weil es gelassen verschmäh, / uns zu zerstören* «.

118 See McGilchrist 2009b (419–21).

119 Mithen 2005 (91); Oelman & Loeng 2003 (393–6).

120 www.youtube.com/watch?v=eafOkWXjqjc&feature=youtu.be: at 06:35.

121 Little, Jones & DeBruine 2011. See also Langlois, Kalakanis, Rubenstein *et al* 2000; and Cunningham, Roberts, Barbee *et al* 1995.

122 Babies less than 72 hours-old: Slater, Quinn, Hayes *et al* 2000; Slater, Bremner, Johnson *et al* 2000; 2–8 month-old babies: Langlois, Roggman, Casey *et al* 1987; 3–6 month-old babies: Samuels & Ewy 1985; 6 month-old infant preferences for attractive faces generalise across sex, race and age: Langlois, Ritter, Roggman *et al* 1991; 5–15 month-old babies prefer attractive premature infant faces: Van Duuren, Kendell-Scott & Stark 2003; effect extends beyond conspecifics: Quinn, Kelly, Lee *et al* 2008; not based on symmetry: Samuels, Butterworth, Roberts *et al* 1994.

123 Lockhart 2009 (37: emphasis in original).

124 Livio 2000 (43).

125 Dirac 1963.

126 Thompson 1992 (1096–7).

127 I am indebted to Julian Marshall for this insight.

128 Peirce 1931–60, vol 5, §130.

129 Tolstoy 2009 (100).

130 Berlyne 1970; Humphrey 1973; Martindale & Moore 1988; Zeki 2001; Seashore & Metfessel 1925.

131 Thybony 1997 (12).

132 Scruton 2009 (27–8).

133 Kant 1793: Part I ‘Critique of aesthetic judgement’; Second Moment, §9; Fourth Moment, §22.

134 Scruton *op cit* (26).

135 See McGilchrist 2009b (153–4).

136 Scruton *op cit* (48).

137 Pope, *An Essay on Criticism*, Part II.

- 138** Tarkovsky 1986 (114).
- 139** Emerson, 'Beauty': 2004 (161).
- 140** Dickinson, fr 988 (in the Harvard *variorum* edition).
- 141** Moore, 'In Distrust of Merits'.
- 142** Keats, 'Endymion'.
- 143** Dickinson, fr 1474 (in the Harvard *variorum* edition).
- 144** Tarkovsky 1983.
- 145** Tarkovsky 1986 (42).
- 146** Mitterschiffthaler, Fu, Dalton *et al* 2007.
- 147** A few of the undoubted difficulties in knowing what it is that one is measuring here are outlined in a paper by Nadal and colleagues (Nadal, Munar, Capó *et al* 2008).
- 148** Liu, Brattico, Abu-Jamous *et al* 2017.
- 149** Hadravová 2019.
- 150** Nadal, Munar, Capó *et al* 2008.
- 151** Jacobsen & Höfel 2003. See also Brattico, Jacobsen, De Baene *et al* 2003; Jacobsen & Höfel 2001.
- 152** Nadal *et al*, *op cit*.
- 153** Huang, Huang, Luo *et al* 2016,. On the relationship between classical music and intelligence, see, eg, Kanazawa & Perina 2012; also Dutton 2013.
- 154** Hart 2013 (279–80).
- 155** Conway & Rehding 2013 (3–4).
- 156** Lotman & Nikolaenko 1983.
- 157** Badaway 1965 (24ff); Pile 2005 (29).
- 158** See, eg, Noguchi & Murota 2013; Singh 1985.
- 159** Meisner 2015.
- 160** Brownlee 2015.
- 161** Davis and Altevogt investigated the anthropometric proportions described by Leonardo's contemporaries (ratio between height and the distance of navel from the ground) in 459 German and Indian subjects. In the Germans, they found the average to be the golden ratio precisely to three decimal places: 1.618 (100% of ϕ) with a range from 1.610 (99.5%) to 1.637 (101.2%). In the Indians, they found an average of 1.626 (100.5% of ϕ), with a range between 1.623 (100.3%) and 1.634 (100.9%), also very close to the golden ratio (Davis & Altevogt 1979). A more recent study found the same value of 1.626 (100.5% of ϕ), with a range of 1.573 (97%) and 1.671 (103.3%) in 20 Italian subjects (Iosa, Morone, Bini *et al* 2016). If this degree of precision were encountered in any other biological context, it would be considered compelling. For a review of other possible instances of ϕ in the human frame and other human phenomena, see Iosa, Morone & Paolucci 2018.
- 162** Meisner 2015.
- 163** Di Dio, Macaluso & Rizzolatti 2007; Iwasaki, Noguchi & Kakigi 2018.
- 164** di Ludovico 2010, vol 1 (239); referring to the research of Lotman and Nikolaenko 1983.
- 165** Ramachandran & Hirstein 1999.
- 166** Bertamini, Silvanto, Norcia *et al* 2018. See also, for similar assessments: Bertamini & Makin 2014; Brysbaert 1994; Wilkinson & Halligan 2002; Di Dio, Canessa, Cappa *et al* 2011; Wright,

Makin & Bertamini 2017; Wright, Makin & Bertamini 2015; Corballis & Roldan 1974; Bona, Cattaneo & Silvanto 2015; Bona, Herbert, Toneatto *et al* 2014; Prete, Fabri, Foschi *et al* 2017; Makin, Rampone, Wright *et al* 2014; Jacobsen, Schubotz, Höfel *et al* 2006; Verma, van der Haegen & Brysbaert 2013.

167 Bauer, Yazzolino, Hirsch *et al* 2015.

168 Vecera & Behrmann 1997.

169 Saito 1997.

170 Koren 2008 (15).

171 Juniper 2003. On music and melancholy, see McGilchrist 2009b. There is a stronger affinity between the right hemisphere and the minor key, as well as between the left hemisphere and the major key (Suzuki, Okamura, Kawachi *et al* 2008). The pre-Socratic philosopher Gorgias wrote that ‘awe [*phrike*] and tearful pity and mournful desire enter those who listen to poetry’, and at this time poetry and song were one (Gorgias, *Encomium*, §9).

172 Wicks 2005 (88).

173 Personal communication.

174 Farrera, Villanueva, Quinto-Sánchez *et al* 2015 (387–96); Van Dongen 2014; Zaidel & Hessamian 2010.

175 There is a ‘biological trend away from perfect symmetry in primates consequent to adaptive evolutionary alteration favouring functional asymmetry in the brain, perception, and face’: Zaidel & Deblieck 2007. See also Swaddle & Cuthill 1995; Zaidel & Cohen 2005. Even when the symmetry is recognised as expressing health, it may still be thought less beautiful: Zaidel, Aarde & Baig 2005.

176 For an opposite view, see, eg, Little, Jones & DeBruine 2011.

177 Rampone, O’Sullivan & Bertamini 2016.

178 I am grateful to Nigel McGilchrist for elucidating that it is a goat standing on its hind legs. *Capra* is the Italian for a goat, and this was the armorial bearings of the Capra family, who owned the Villa Capra at the point of its completion.

179 Tanizaki 1977 (30 & 42).

180 Ruskin 1863, vol 3, Part IV, ch iii, §14 (34).

181 von Balthasar 1989, 95–126: ‘Revelation and the beautiful’ (105).

182 See McGilchrist 2009b (363).

183 Hogan 2017 (89).

184 Hogan 2013 (319).

185 Ishizu & Zeki 2014.

186 Sridharan, Levitin & Menon 2008.

187 Klein, Endrass, Kathmann *et al* 2007; Brass & Haggard 2007.

188 Craig 2010.

189 *ibid*: ‘The insula, and especially the anterior insula, is known to play a critical role in emotional processing’.

27. PURPOSE, LIFE AND THE NATURE OF THE COSMOS

- 1 Nietzsche 1913, §204.
- 2 Whitehead 1933 (341).
- 3 Dewey 1984 (204).
- 4 Steiner 1978a (16).
- 5 Hart 2013 (282–3).
- 6 See Chapter 12.
- 7 Popper 1978 (342: emphasis in original).
- 8 It is of some interest that a Jesuit priest (Roger Boscovich) may have proposed a fully deterministic universe more than half a century before Laplace: it is after all the logical conclusion to draw from the existence of an engineering (‘deistic’) God.
- 9 Dawkins 1998 (16). *The Blind Watchmaker*, is, of course, the title of Dawkins’s book published in 1986.
- 10 Steane 2018 (94).
- 11 Kolakowski 1985 (56).
- 12 See Lewontin, Rose & Kamin 1984 (274–5).
- 13 See Ingold 2006.
- 14 Smolin 2013 (xxv–xxvi).
- 15 Letter of Darwin to Asa Gray, 22 May 1860; in Darwin 1887, vol II (312).
- 16 Gray 1874 (81).
- 17 Letter of Darwin to Asa Gray, 5 June 1874; in Darwin 1887, vol III (189).
- 18 Letter of Darwin to Jeffries Wyman, 3 October 1860; in Darwin 1993 (405).
- 19 Darwin 1887, vol III (255).
- 20 Darwin 1887, vol II (80: emphasis added).
- 21 As Gilson points out, ‘normally, mechanism excludes finalism [teleology], but finalism does not exclude mechanism. On the contrary, it necessarily implicates it’ (Gilson 2009, 125).
- 22 Letter of Darwin to William Graham, 3 July 1881; in Darwin 1887, vol I (316).
- 23 Letter of Darwin to TH Farrer, 28 August 1881; in Darwin 1903, vol I (219).
- 24 *ibid.*
- 25 Noble 2017.
- 26 Popper 1978.
- 27 Gilson 2009 (xx).
- 28 See Waddington 1957; and Gare 2017.
- 29 Noble 2017.
- 30 Levitan 2017.
- 31 Kolakowski 1985 (56).
- 32 Wolf & Koonin 2007. The words are repeated in a book of which Koonin is sole author (2011).

33 *ibid.* The Darwin-Eigen spiral, or cycle, is a series of steps allowing a succession of increases in replication accuracy followed by an increase in the size of the genome. Every time the accuracy of replication is increased, it allows an increase in the amount of information coded. This, in turn, allows for the selection of an increase in accuracy, which allows more coding, which allows selection for more information, and so on. Koonin's point is that to start this process requires something that can only be generated once the process is already under way.

34 Koonin 2007 (19: appendix 1).

35 Koonin 2007 (11).

36 Hart has this to say about fine-tuning: 'Certainly all of the cosmos's exquisitely fine calibrations and consonances and exactitudes should speak powerfully to anyone who believes in a transcendent creator, and they might even have the power to make a reflective unbeliever curious about supernatural explanations. But, in the end, such arguments also remain only probabilistic, and anyone predisposed to explain them away will find plentiful ways of doing so ...': Hart 2013 (39). The best known such critic of fine-tuning is Victor Stenger, who contends that 'the claim of fine-tuning of the parameters of physics is equivalent to a claim that our languages have been fine-tuned so they have grammatical rules that are highly unlikely to have occurred naturally ... No fine tuning; units are chosen for convenience and have no fundamental significance': Stenger 2013 (48 & 50). This seems to me to mistake the representation for that which is represented. The units could have been otherwise, of course; but they refer to realities that are independent of the units, just as two languages will use different words to describe the same table and chair. It doesn't matter what symbols, concepts or terms are used: the universe would not have come into existence for there to *be* humans and their symbols, concepts and terms without the 'six numbers' of Martin Rees having the values they do. To take a homely example, a value that is clearly *not* one of those numbers, the freezing point of water is 'chosen for convenience' as 0°C, a 'number which has no fundamental significance'; it could just as easily have been, say, 32°, as it is Fahrenheit. But so what? If water didn't have the freezing point it does – however you measure it and whatever you call it – the seas might never have given rise to life.

37 Bersanelli 2011 (204: emphasis in original).

38 Lennox 2011 (53).

39 See Ellis 2011: 'All the parallel universes lie outside our horizon and remain beyond our capacity to see, now or ever, no matter how technology evolves. In fact, they are too far away to have had any influence on our universe whatsoever. That is why none of the claims made by multiverse enthusiasts can be directly substantiated.'

40 See astrophysicist Marco Bersanelli: 'Nothing really happens in a world where everything always goes on infinitely often ... We need a concept of infinity in which genuine novelty can happen': Bersanelli *op cit* (205 & 214).

41 Steane 2018 (91).

42 Kelemen, Rottman & Seston 2013.

43 Goldstein, Taylor, Tumulka *et al* 2005.

44 Orr 2013.

45 Park 2009 (11).

46 See, eg, Piran, Jimenez, Cuesta *et al* 2016.

47 In theory, according to cosmologist Alan Heavens (2016), Director of the Imperial Centre for Inference and Cosmology at Imperial College London, either the constant should be hundreds of orders of magnitude higher than it appears to be, or it should be zero, in which case the universe

wouldn't accelerate. But this would disagree with what astronomers have observed: 'The small – but nonzero – size of the cosmological constant is a real puzzle in cosmology'.

[48](#) Polkinghorne 2008.

[49](#) Summers, Dave, Dolstra *et al* 2014.

[50](#) Skinner 2016.

[51](#) Reiber, Shattuck, Fiore *et al* 2010.

[52](#) Andersen, Gerritsma, Yusa *et al* 2009.

[53](#) Thomas, Ulitsky, Augier *et al* 2003.

[54](#) Vyas, Kim, Giacomini *et al* 2007.

[55](#) Fuller Torrey & Yolken 2003; Yolken, Dickerson & Fuller Torrey 2009.

[56](#) See, eg, for a review, Fouad & Aanei 2017.

[57](#) Darwin 1859 (61).

[58](#) Letter of Darwin to JD Hooker, 12 July 1860; in Darwin 1887, vol III (263); letter of Darwin to JD Hooker, '1861'; *ibid* (265).

[59](#) Gilson 2009 (24).

[60](#) Smolin 2013 (221–2).

[61](#) Watanabe 1969 (70 & 75): 'In quantum mechanics, a physical state changes according to two completely different kinds of processes. First, the state changes gradually with the course of time and following a certain differential equation termed a wave equation. This process is causal and reversible. Second, the state changes abruptly the moment the observer makes a new observation of the system. This process is statistical and irreversible. Quite naturally, the renewal of the investigation changes the knowledge of the state, and hence the state itself. It can be demonstrated that entropy is not in the least changed by the first process. (This is intimately bound up with the fact that the process of change is reversible.) On the other hand, entropy changes rapidly in the second process, and always so as to increase. This means that the act of observation itself increases the entropy: a shocking situation in the eyes of classical physicists since an objective physical measure is now closely dependent on the intervention of the observing subject. The principle of entropy is no longer a simple physical law, but must be considered as the law of the development of knowledge. In the new mechanics, entropy measures, so to speak, the degree of precision of our knowledge ... the principle of entropy applies only to the object observed by the observer. This involves two important consequences. In the first place, to speak of the entropy of the entire universe is to risk passing beyond the boundaries of science ... Secondly, the increase of entropy applies only to what is observed, and consequently not at all to the observer ... The observing self is thus always excluded from the field to which the law of entropy applies'.

[62](#) Bernard 1885 (344): « *La doctrine matérialiste est tout aussi inexacte, en ce que les agents généraux de la nature physique capables de faire apparaître les phénomènes vitaux isolément n'en expliquent pas l'ordonnance, le consensus et l'enchaînement.* »

[63](#) Leibniz, letter to Burchard de Volder, 30 June 1704.

[64](#) Heisenberg 1958 (42: emphasis added).

[65](#) Mermin 1998.

[66](#) Kass 1988 (261).

[67](#) Whitehead 1929b (2–3; emphasis in original).

[68](#) Johnson, Hebsgaard, Christensen *et al* 2007. Nor are they dormant, but in a metabolically active state, relying on DNA repair.

- 69** Kolakowski 1985 (59).
70 von Bertalanffy 2003 (192).
71 Whitehead 1929b (5: emphasis in original).
72 Kass 2004 (287).
73 Charlton 2016.
74 Charlton 1996.
75 Charlton 2016.
76 *ibid.*
77 See especially Barbara McClintock.
78 See, eg, Ridley 1996.
79 James 1890, vol 1 (7).
80 Kolakowski 1985 (58).
81 Prigogine 1997 (3).
82 Whitehead 1929b (12).
83 Nagel 2012 (28).
84 Townes 2005.
85 Descartes 1994 (87).
86 Gilson 2009 (23).

28. THE SENSE OF THE SACRED

1 Letter of Einstein to Queen Elizabeth of Belgium, 19 September 1932; in Dukas & Hoffmann 1979 (48).

2 » *Nach einem alten Satz trennt uns der erste Schluck aus dem Becher der Erkenntnis von Gott, aber auf dem Grunde des Bechers wartet Gott auf den, der ihn sucht.* « Usually, and probably wrongly, attributed to Heisenberg: it comes from von Weizsäcker 1948 (124: very generally cited as 152, despite the book having only 138 pages).

3 Anon, *The Cloud of Unknowing* (fourteenth century) 1961 (60).

4 Blake, 'America: a Prophecy', Plate 8.

5 Cf Mary Midgley 2006 (45: emphasis in original): 'This cosmos is, after all, the one that has produced us and has given us everything that we have. In what sense, then, is it *hostile*? Why this drama?' It is itself a myth generated by the Cartesian view of mind over against the world, the view that Schelling's philosophy transcended.

6 Einstein 1936a (351) and 1936b (315): » *Das ewig Unbegreifliche an der Welt ist ihre Begreiflichkeit ... die Welt unserer Sinneserlebnissen [ist] begreifbar, und dass sie es ist, ist ein Wunder.* «

7 Wittgenstein 1961, §6.44.

8 Wittgenstein 1984 (63e) & 1998 (72e).

9 Underhill 1914 (60–1).

10 Shelley 1921.

11 Whitehead 1938 (68).

12 See McGilchrist 2009b (ch 3).

13 Magee 1998a (98).

14 Rilke 2011 (21).

15 Polkinghorne 2008.

16 Whitehead 1933 (153 & 293).

17 Suzuki 1999 (52).

18 Confucius, *Analects*, XVII, §19.

19 Lao Tzu, *Tao Te Ching*, §1.

20 Waismann.

21 Shortt 2019b (37–8).

22 Tong 2016.

23 Berry 2000 (29): 'If at last "all tangible phenomena" are empirically reduced to the laws of physics, then we will merely have completed a circle. We will have arrived again at the question that preceded Genesis: where did the physical come from? And physics of course can have no answer.'

24 Hart 2013 (18).

25 On this, see Smolin 2013 (97–8).

26 *ibid* (xxvii): ‘Nor do the laws of nature wait, mute, outside of time for the universe to begin. Rather the laws of nature emerge from inside the universe and evolve in time with the universe they describe.’

27 Wittgenstein 1961, §6.371 (emphasis added). And he continues: ‘the view of the ancients is clearer in so far as they have a clear and acknowledged terminus, while the modern system tries to make it look as if everything were explained.’ §6.372.

28 James 1902 (39). Cf Cusanus 1985, I, 2, §8: ‘someone who desires to grasp the meaning must elevate his intellect above the import of the words rather than insisting upon the proper significations of words which cannot be properly adapted to such great intellectual mysteries’.

29 Heraclitus’ *logos* is not to be confused with the very different *logos* of post-Platonic philosophy.

30 Kolakowski 1985 (33).

31 Xenophanes fr 34 (Diels’ notation, trans Burnet).

32 Augustine, ‘*Si enim comprehendis, non est Deus*’: Sermon 117.

33 Cusanus 1985: ‘*Et quanto in hac ignorantia profundius docti fuerimus, tanto magis ipsam accedimus veritatem*’ (*De docta ignorantia* I, 3).

34 Maimonides 1919, Bk I, ch lvii.

35 Mahood 1996.

36 Suzuki 1999 (52–3).

37 Rumi, *Mathnawi* II: 717–8; from 1999 (111). This formulation parallels the Christian doctrine of the Trinity.

38 Tillich 1958.

39 Dionysius the Areopagite (also known as Pseudo-Dionysius), *The Divine Names*, ch 1, §1: 1920 (53).

40 Gray 2018 (9).

41 Collingwood 1940 (5–6: emphasis added).

42 *ibid* (9).

43 *ibid* (10).

44 Wittgenstein 1981 (74e): entry for 8 July 1916.

45 McCabe 2010 (128).

46 Plotinus, *Enneads*, Bk V, Tractate IV, §14 (trans S MacKenna & BS Page).

47 The phrase in this form is George Steiner’s: 1978b (27).

48 Thus he spoke of *Seinsvergessenheit* and *Seinsverlassenheit*.

49 Eckermann 1970 (296): entry for 18 February 1829.

50 Whitehead 1938 (232).

51 Pieper 1998 (106).

52 Schelling, ‘Seventh Lecture’: 1856–61b (137): » *Bei jeder Erklärung ist das Erste, daß sie dem zu Erklärenden Gerechtigkeit widerfahren lasse, es nicht herabdrücke, herabdeute, verkleinere oder verstümmle, damit es leichter zu begreifen sey. Hier fragt sich nicht, welche Ansicht muß von der Erscheinung gewonnen werden, damit sie irgend einer Philosophie gemäß sich bequem erklären lasse, sondern umgekehrt, welche Philosophie wird gefordert, um dem Gegenstand gewachsen, auf gleicher Höhe mit ihm zu seyn. Nicht, wie muß das Phänomen gewendet, gedreht, vereinseitigt oder verkümmert werden, um aus Grundsätzen, die wir uns einmal vorgesetzt nicht zu überschreiten, noch*

allenfalls erklärbar zu seyn, sondern: wohin müssen unsere Gedanken sich erweitern, um mit dem Phänomen in Verhältniß zu stehen. Wer aber aus was immer für einer Ursache vor einer solchen Gedanken-Erweiterung Scheu trüge, der sollte, anstatt die Erscheinung zu seinen Begriffen herabzuziehen und zu verflachen, wenigstens so aufrichtig seyn, sie in die Zahl der Dinge zu setzen, deren es für jeden Menschen noch immer sehr viele gibt, in die Zahl der Dinge, die er nicht begreift; und wenn er unfähig ist, sich selbst zu dem den Erscheinungen Gemäßen zu erheben, sollte er wenigstens sich hüten, das ihnen völlig Unangemessene auszusprechen « (emphasis in original).

53 Eg, Heller 2011 (222: emphasis in original): ‘We collect information from inside a given spacetime (by following the behaviour of geodesics in it) to learn something about the way its structure breaks down. The *apophatic* character of our knowledge is mitigated by tracing vestiges of what we do not know in the domain open to our investigation’.

54 Plotinus *op cit*.

55 Panikkar 2001 (350–1).

56 Heschel 1955 (46).

57 Pascal 1976, §267 (Lafuma §188): « *La dernière démarche de la raison est de reconnaître qu’il y a une infinité des choses qui la surpassent. Elle n’est que faible si elle ne va jusqu’à connaître cela* ».

58 Wright 1995 (59); quoted in Zwicky 2014b, §87(b). Cf Eckhart, ‘Sermon on the Fourth Sunday after Trinity’, 1958 (194): ‘God is not found in the soul by adding anything, but by a process of subtraction’.

59 Thoreau 1906, vol 12 (371): entry for 4 October 1859 (emphasis in the original).

60 Gao & Lan 2018 (254).

61 Pieper 1990 (31).

62 Augustine, *Tractates on the Gospel of St John*: XXIX, §6 (trans P Schaff): ‘*Ergo noli quærere intelligere ut credas, sed crede ut intelligas*’.

63 Berry 2000 (35).

64 Graham 2010 (176).

65 Gaisman 2018.

66 On this I find the words of Hermann Hesse, writing just after the First World War, thought-provoking: ‘All the good in a man, for which he is praised or loved, is merely good suffering, the right kind, the living kind of suffering, a suffering to the full ... From suffering springs strength, from suffering springs health’: ‘Zarathustra’s return’ (1919; in 2018, 96 & 98).

67 Eckhart, Sermon (Pfeiffer) III: 2009 (49). Wherever I have quoted from Eckhart in this chapter I have compared the translations by Evans with those by Walshe, and have in each case used whichever seemed to me clearer. I have retained Pfeiffer’s 1857 numeration (also used in the earlier Evans translation) for ease of reference and comparison.

68 *ibid* (50).

69 Eckhart, Sermon (Pfeiffer) XLII: 2009 (237).

70 In Walshe’s translation of this Sermon (Pfeiffer IV) this passage is translated thus: ‘The only name it has is “potential receptivity” which certainly does not lack being, nor is it deficient, but it is the *potential* of receptivity in which you will be perfected ...’: 2009 (56: emphasis in original). Modern German texts, in different translations, give *die Möglichkeit des Empfangens* or *eine vermögende Empfänglichkeit*. Thus Quint, 1955: » *Ihr Name besagt nichts anderes als eine Empfänglichkeitsanlage, dies (indessen) durchaus nicht des Seins ermangelt oder entbehrt, sondern eine vermögende Empfänglichkeit, worin du vollendet werden sollst*. « This is no doubt correct, but gives an impression of greater abstraction than the Middle High German original: » *Was ist das*

dünsternuzz und das unwizzen oder wie sind sein nam? Sein namen sint nicht anders dann ein mynnecliches enpfencklicheit die dann zūmal wesens nich mangelt. Es ist auch ein möglich enpfencklicheit durch die es alles volbracht ist. « (Steer, Klimanek & Löser 2002, 427–8.) This to me has a quite different energy. First of all, unlike Quint (and Walshe following him), it speaks expressly about ‘unknowing’, *das unwizzen*, which is lost in subsequent translations into modern German and English. The word *mynneclich* is also passed over in both. Its root is *minne*, meaning primarily love (as in *die Minnesänger*, the wandering minstrels who sang of courtly love), but also remembrance. Then there is the richness of *enpfencklicheit*, which suggests, to different degrees, a complex of meaning including, along with receptivity, a sensitivity or inclination towards, attunement to, susceptibility for, a responsiveness, openness and alertness to, as well as a vulnerability and tenderness towards its object.

71 Eckhart, Sermon (Pfeiffer) VII: 2009 (73).

72 Eckhart, Sermon (Pfeiffer) IX: 2009 (86).

73 McKinnell 2017; Taylor 2009 (170: emphasis in original).

74 See McGilchrist 2009b (72–5).

75 Gunaratana 2011 (132–46).

76 Earle 1981.

77 It is no coincidence that Wordsworth was Whitehead’s favourite poet, as he is mine. ‘The deepest impact on Whitehead came through the poetry of Wordsworth, which he studied throughout his life. According to his daughter’s testimony, he would read *The Prelude* almost daily “as if it were the Bible, poring over the meaning of various passages” (Wyman 1956, 283).

78 Cf Rupert Spira (2002): ‘Sacred art is work that comes from a deep desire to explore the true nature of our experience, or from an intuition of it. So if we are trying to find out who we really are and what the world really is, it makes no sense to predefine or limit either ... Sacred art takes us beyond these limitations, because it is inspired by that which is beyond them. If a work of art is inspired by these limitations it will only lead the viewer back to them. We could say that a work of art is like a pathway; it bears the signature of its origin. The senses are the medium through which we travel this path ... But true art comes from transparency, not from feelings of isolation, separation or despair. Of course, such feelings often precipitate the sort of openness and sensitivity that are the origin of creativity, but it is important to make this distinction, because without it we may think that these feelings are themselves the source of creativity and we end up with an art form that celebrates the hopeless, banal, vacuous despair of a culture whose paradigm has lost sight of the sacred, of any true enquiry into the nature of reality ...’

79 Jason Cowley (2018) on the philosopher Bryan Magee: ‘He describes sex as an “other-worldly” experience and likens its effects to that of great music, “the deepest we can penetrate into a world other than this world, the world beyond appearances”’.

80 Wordsworth, ‘Tintern Abbey’.

81 Sir Thomas Browne (*Religio Medici*, I, xvi): ‘Thus there are two Books from which I collect my Divinity; besides that written one of God, another of his servant Nature, that universal and publick Manuscript, that lies expans’d unto the Eyes of all, those that never saw him in the one, have discovered him in the other ... all things are artificiall; for Nature is the Art of God’.

82 Tillich 1958.

83 Tillich *loc cit*.

84 Nettl 1983. See also McGilchrist 2009b (77).

85 Suzuki 1999 (17). *Ba’ojing Sānmèi* is also widely known by its Japanese title, *Hōkyō Zanmai*.

86 Habermas commented on an atheist friend who nonetheless wanted a church burial: ‘the enlightened modern age has failed to find a suitable replacement for a religious way of coping with the final *rite de passage*.’ On this, Stanley Fish (2010) observed: ‘The point can be sharpened: in the context of full-bodied secularism, there would seem to be nothing to pass on to, and therefore no reason for anything like a funeral.’

87 MacGregor 2018 (10).

88 Rée 2019.

89 James 1902 (37–8).

90 Wittgenstein 1961, §6.52.

91 Rée *op cit*.

92 Panikkar 2001 (351: emphasis added).

93 This is the title of a book on the Kabbalah by Rabbi David Cooper (1997). ‘God is a verb’ is also, I should point out, the title of a slightly ghastly poem by Buckminster Fuller, which understands the phrase in its own particular way.

94 *Tao Te Ching*, §32 (trans G-F Feng & J English: emphasis added).

95 See Paul Ricoeur’s *La métaphore vive* (1975), translated as *The Rule of Metaphor* (1977) – the title thereby losing its metaphoric power.

96 As recorded in Heisenberg 1971, ‘Science and religion’: 82–92 (88).

97 *ibid* (89). He even went on to say of divine intervention, a concept on which I have to acknowledge the extent of my ignorance, that ‘we quite obviously do not refer to the scientific determination of an event, but to the meaningful connexion between this event and others or human thought. Now this intellectual connexion is as much a part of reality as scientific causality; it would be much too crude a simplification if we ascribed it exclusively to the subjective side of reality’ (91).

98 Cusanus 1985: I, 1, §4: ‘Every inquiry proceeds by means of a comparative relation, whether an easy or a difficult one. Hence, the infinite, qua infinite, is unknown; for it escapes all comparative relation.’

99 Rilke, from *Mir zur Feier: Gedichte* (composed 1897, published 1899: trans IMcG): *Ich fürchte mich so vor der Menschen Wort*.

Sie sprechen alles so deutlich aus.

Und dieses heißt Hund und jenes heißt Haus,

und hier ist der Beginn und das Ende ist dort.

Mich bangt auch ihr Sinn, ihr Spiel mit dem Spott,

sie wissen alles, was wird und war;

kein Berg ist ihnen mehr wunderbar;

ihr Garten und Gut grenzt grade an Gott.

Ich will immer warnen und wehren: Bleibt fern.

Die Dinge singen hör ich so gern.

Ihr rührt sie an: sie sind starr und stumm.

Ihr bringt mir alle die Dinge um.

100 Bartholomeus de Capua, in D Prümmer OP (ed), *Fontes vitae S Thomae Aquinatis*, Toulouse [undated: foreword, however, dated 1911], §79, 377: ‘ego adiuro te per Deum vivum omnipotentem et per fidem quam tenetis ordini nostro et per caritatem quam michi stringeris quod ea que tibi dixero

nulli reveles in vita mea ... Omnia que scripsi videntur michi palee respectu eorum que vidi et revelata sunt michi. I have preserved the unorthodox mediaeval Latin spelling.

101 As one might expect, it has been suggested that Thomas could have had a stroke. However, this is wholly unsubstantiated. Aquinas was not aphasic, and his intellectual and speech abilities remained unaltered until his death, which makes a left hemisphere stroke, as an explanation of his sudden aversion to using words, unlikely; a right hemisphere stroke would hardly have opened his eyes to what it is that language fails to capture. See Charlier, Saudamini, Lippi *et al* 2017.

102 Dyson 1958 (78).

103 Eckhart, Sermon (Pfeiffer) XLII: 2009 (74: emphasis in original).

104 Quinn 2002 (219).

105 Porete 1927 (26). ‘Forgettelle is her name, for it is her manner much to comprehend and soon to forget.’

106 Eckhart, Sermon (Pfeiffer) LXXXVII: 1931–47, vol 1 (221).

107 Plotinus, *Enneads*, Bk I, Tractate VI, §9 (trans S MacKenna & BS Page). Eckhart also said of the knowledge of God: ‘The eye with which I see God is the same with which God sees me. My eye and God’s eye is one eye, and one sight, and one knowledge, and one love.’ Sermon (Pfeiffer) XCVI: 1931–47, vol 1 (240).

108 Kolakowski 1985 (33).

109 Heschel 1997 (175ff).

110 Moore 1966 (140).

111 *Bhagavad Gita*, ch 6 v 30 and ch 9 v 15, trans J Mascaró.

112 Panikkar 2004 (162).

113 Joyce 2000 (233).

114 From ‘The anthropic universe’ 2006: www.abc.net.au/radionational/programs/scienceshow/the-anthropic-universe/3302686 (see transcript).

115 Acts 17:28. I am grateful to Nick Spencer for pointing out that this phrase appears to originate with Epimenides’ *Cretica*, where it refers to Zeus.

116 Ingold 2006 (10: emphasis added). As Schelling understood, the distinction between humanity and the world comes very late in our history: it would be anachronistic to think of concepts which we owe to the furthest past of human history as the result of efforts of a subject to make sense of the world by holding a theory about it.

117 Not coincidentally, Paley likened the world to just such an object fallen in one’s path: ‘In crossing a heath, suppose ... I had found a watch upon the ground, and it should be inquired how the watch happened to be in that place...’

118 Men 1997, vol 2.

119 Muir 1875 (364).

120 Eckermann 1889–96, vol 6: entry for 13 February 1829. The contrast that Goethe is getting at here between *Verstand* and *Vernunft* could be rendered as the contrast between Bergson’s *intellect* and *intuition*, the Latin *ratio* and *intellectus*, Greek *dianoia* and *nous* – and, effectively, LH and RH. The slightly unsatisfactory phrase ‘intuitive reason’ is the best I can do to capture the combination of reasoning and intuiting expressed by *Vernunft*. » *Der Verstand reicht zu ihr nicht hinauf, der Mensch muss fähig sein, sich zur höchsten Vernunft erheben zu können, um an die Gottheit zu rühren, die sich in Urphänomenen, physischen wie sittlichen, offenbaret, hinter denen sie sich hält und die von ihr ausgehen. Die Gottheit aber ist wirksam im Lebendigen, aber nicht im Toten; sie ist im Werdenden*

und sich Verwandelnden, aber nicht im Gewordenen und Erstarrten. Deshalb hat auch die Vernunft in ihrer Tendenz zum Göttlichen es nur mit dem Werdenden, Lebendigen zu tun, der Verstand mit dem Gewordenen, Erstarrten, dass er es nutze. «

121 Drob 1997. *Keter* is the highest of the *Sefirot*.

122 These words are repeated after every day's work, except for the second day. But as has been pointed out, on this day, uniquely, God did not create, but rather divided what had already been created.

123 Quite why this happened reveals the treachery of language. 'Why had the Authorised Version plumped for "was made"? Because in Latin, "I become" is *fio*, whose past tense is *factus sum*', writes Lucas. The point is that the translators of the Authorised Version of the Bible where possible followed earlier translations, which in turn had been made from the Latin Vulgate. The paper was privately communicated to me, and is not, as far as I know, published: before he died Lucas gave me permission to quote from it and to make it available on my website.

124 Radler 2010.

125 Eckhart, Sermon (Pfeiffer) XXVI: 1931–47, vol 1 (76). I gratefully acknowledge Professor Charlotte Radler's help.

126 I cannot trace the origin of this exact phrase, though it is frequently repeated in anthologies, and expresses well what Eckhart never formulated quite so succinctly. The closest would seem to be in Sermon (Pfeiffer) LXXXV: 'God has been begetting his only-begotten Son and is giving birth to him ... now and eternally, he, like any woman, being brought to bed in every virtuous soul who has embarked on the interior life ... What does it profit me the Father's giving his Son birth unless I bear him too? God begets his Son in the perfect soul and is brought to bed therein that she may bring him forth in all her works': 1931–47, vol 1 (216). There are also parallels in 'The nature of the soul ... want[s] to have God begotten in her': Sermon (Pfeiffer) XX: 1931–47, vol 1 (65); and 'He *must* be born in you' (Sermon 24a [no Pfeiffer equivalent], 2009 (160). I am grateful to Professor Bernard McGinn, Dr Rebecca Stephens and Fr Richard Woods OP for their advice here.

127 Mechthild of Magdeburg 2012.

128 Eckhart, Sermon (Pfeiffer) LXVI: 1931–47, vol 1 (164); and cf 'God makes the world and all things in this present now': Sermon (Pfeiffer) LXXXIII, *ibid* (209).

129 See below; and lecture by this author, entitled 'Wanting and longing' delivered at Heythrop College, 7 March 2017: www.youtube.com/watch?v=ISiKK2x4LJg (accessed 15 March 2021).

130 Boehme 1920: 'The Fourth Text', §9 and §1. Rückert's lines addressed to his beloved, and set to music by Schubert in 'Du bist die Ruh', come to mind: » *Die Sehnsucht du, und was sie stillt. «*

131 Emerson 1836 (13).

132 From a marginal note by Coleridge, contrasting Shakespeare with Beaumont and Fletcher, made between 1815 & 1819 in a copy of *The Dramatic Works of Ben Jonson, Beaumont and Fletcher*, 1811: in Raysor 1936 (88–9: emphasis in original).

133 Coleridge 1987, vol II (495).

134 Nuttall 2007 (181).

135 Coleridge 1817, vol II (20).

136 Coleridge 1856, lecture IX (107).

137 OED: 'If ... the filaments ... are free and distinct, but the anthers are connected together, so as to form one body, then your plant will be found in the class syngenesia': taken from Jean-Jacques Rousseau's *Letters on the Elements of Botany*, as translated by Thomas Martyn, 1794 (94).

138 Coleridge 1987, vol II (151).

- 139** Coleridge 1817, vol II (22).
- 140** Coleridge 1987, vol I (69).
- 141** Coleridge 1962, §2086.
- 142** Eliot, 'The three voices of poetry', in 1957 (102). I owe this connexion to Perry 1999.
- 143** Coleridge 1962, §2208 (emphasis in original).
- 144** Segall 2018 (emphasis added).
- 145** Eckhart, Sermon (Pfeiffer) XII: 2009 (101).
- 146** Whitehead 1929a (208).
- 147** *ibid* (348 & 349).
- 148** Heraclitus fr LII [Diels 84a, Marcovich 56A].
- 149** Thus Cusanus saw in God the *coincidentia* of motion and rest, 'not as two but as above duality and otherness' (Cusanus 1978b, §74).
- 150** Pauli 1994 (48: emphasis added). In a footnote to the remark about 'theory of becoming', he adds: 'One may, following [the Swiss mathematician and philosopher] F Gonseth, denote the interplay of the two aspects as "dialectical".'
- 151** Bohm 1980 (ix).
- 152** The terms he used were, respectively, *complicatio* & *explicatio*. This is not dissimilar to an idea in Eckhart, Sermon (Pfeiffer) VII: 2009 (87): 'How marvellous to be without and within, to embrace and be embraced, to see and be seen, to hold and be held – that is the goal, where the spirit is ever at rest, united in joyous eternity.'
- 153** See Whitehead 1929a (341–9): and, for discussion, Oomen 2015. This is not to be seen as two separate processes, one attributable to God, the enrichment of potential; and the other to the World, the enrichment of actualisation. Rather, the World is that aspect of God that gets to be actualised, towards which God strives just as much as to ever-renewed potential. Cf Whitehead 1933 (357): 'We must conceive the Divine Eros as the active entertainment of all ideals, with the urge to their finite realization, each in its due season. Thus a process must be inherent in God's nature, whereby his infinity is acquiring realization.'
- 154** Bond 1997 (58).
- 155** Similarly in the Kabbalah, *Ein-sof* includes within itself, although distinct, the *Sefirot*, which are modes or attributes through which God's Being is manifest in the cosmos.
- 156** *Ein-sof* should be understood as God prior to any self-manifestation: *Ein* is a negative, *sof* means grasp. This is conventionally translated as the Infinite. Is it possible that it also suggests that which cannot be grasped (or indeed that which itself *does not grasp*)?
- 157** Drob 2009 (133).
- 158** Whitehead 1929a (351).
- 159** *ibid* (342–3).
- 160** Mermin 1998 (emphasis added).
- 161** Theise & Kafatos 2016.
- 162** Miller 2017.
- 163** 'Yatha pinde tatha brahmande, yatha brahmande tatha pinde.'
- 164** Drob 1997 (emphasis added).
- 165** Whitehead 1929a (28).

166 Bohm 1989.

167 See, eg, Currivan 2017.

168 See, eg, Beck 1969 (58).

169 William Earle, describing what he calls the Technical Philosopher of the mid-twentieth century, writes that he ‘is the point of pure negativity, an eye which would like to see pure light but *cannot because of visible things*’ (Earle 1960, 374: emphasis added).

170 Goethe, ‘Epirrhema’. Hadot has written well of Goethe and this ‘open secret’: see Hadot 2006, esp ch 9, ‘Isis has no veils’, 247–61. One of Hadot’s phrases is especially apt: ‘if Isis is without veils, it is because she is entirely form, that is, entirely veil; she is inseparable from her veils and her forms’ (259).

171 *Tao Te Ching*, §1 (trans G-F Feng).

172 *De visione Dei*, ch ix, §36, lines 1–3: ‘*Unde experior, quomodo necesse est me intrare caliginem et admittere coincidentiam oppositorum super omnem capacitatem rationis et quærere ibi veritatem, ubi occurrit impossibilitas*’; and ch x, §40, lines 1–2: ‘*Unde in ostio coincidentiae oppositorum, quod angelus custodit in ingressu paradisi constitutus, te, domine, videre*’ (translations from Cusanus 1960, 43 & 46).

173 Dionysius 1923 (9 & 12). Cf Thomas Merton’s ‘Prayer before Midnight Mass’, Christmas 1941: ‘Your brightness is my darkness. I know nothing of You and, by myself, I cannot even imagine how to go about knowing You. If I imagine You, I am mistaken. If I understand You, I am deluded. If I am conscious and certain I know You, I am crazy. The darkness is enough.’

174 Henry Vaughan, ‘The Night’.

175 Cusanus 1978a, §67.

176 Cusanus 1988, §92. See Hopkins undated.

177 Cusanus 1985, §76.

178 Bond 1997 (22: emphasis added).

179 McCosker 2008 (46).

180 Nelson 2014 (76).

181 Quoted in Kingsland 1927 (94).

182 Ruysbroeck J, ‘De calculo’, *The Sparkling Stone*, c1340: quoted thus at Underhill 1911 (vi: emphasis added). On page 423 of the same book, it is quoted slightly differently: ‘We behold that which we are, and we are that which we behold; because our thought, life and being are uplifted in simplicity and made one with the Truth which is God.’

183 Schelling 1994 (130: emphasis in original).

184 Spinoza 1910, V, §24 (214).

185 Scruton 1996 (78).

186 According to Joseph Campbell (1991), his teacher the Indologist Heinrich Zimmer used to say: “‘The best things can’t be told” – because they transcend thought. “The second best are misunderstood” – because those are the thoughts that are supposed to refer to that which can’t be thought about ... and one gets stuck with the thoughts. “The third best are what we talk about”’. (I have rationalised the punctuation.)

187 Drob 1997.

188 *ibid.*

189 Hegel 1975, Part I, §215.

- 190** Zukav 1979 (284). In Christology, Christ is not simply man, nor simply God, nor both, nor neither.
- 191** Hafiz 2002 (153). I am told that Ladinsky's translations are somewhat free.
- 192** James, letter to Charles Strong, 9 April 1907; in H James 1920, vol 2 (269).
- 193** Scheler, 'Supplementary remarks: ideas are not pre-existing things'; in 2008 (408).
- 194** Tedlock 1996 (65–6 & 226). This insight comes from Tedlock's Mayan teacher Andrés Xiloj. I take this account from Thomas Alexander (2016), where he contrasts it with what he sees as the more imperative account of creation in Genesis.
- 195** Dan 1986 (90): quoted in Drob *op cit*.
- 196** Peterson 2018 (343).
- 197** See, eg, McGilchrist 2009b (173ff & 230–1).
- 198** Stark 2013 (107). I am indebted to Patrick Curry for drawing this phrase to my attention.
- 199** Eckhart, Sermon (Pfeiffer) IV: 2009 (58).
- 200** *Tao Te Ching*, §2 (trans Y Wu).
- 201** *Tao Te Ching*, §2 (trans S Senudd).
- 202** *Tao Te Ching*, §2 (trans JCH Wu).
- 203** Azriel, 'The explanation of the ten Sefirot', 1966 (emphasis added). See also Scholem 1987, 423.
- 204** Drob 2000.
- 205** See Chapter 25.
- 206** Eckhart, Sermon (Pfeiffer) C: 2009 (467).
- 207** McGinn 2001 (84 & 93–4). The passage referred to is from Eckhart's 'Expositio sancti Evangelii secundum Iohannem', in Christ, Decker, Koch *et al* 1994, vol 3 (485).
- 208** *Tao Te Ching*, §4
- 209** Byers 2007 (103–4).
- 210** Hegel 1975, Part I, §88.
- 211** *ibid*.
- 212** Hegel 1969, §956 (emphasis added).
- 213** Azriel 1966 (94: emphasis added).
- 214** Cusanus 1985, I, 26, §89.
- 215** *ibid*, I, 17, §47.
- 216** Eg, *Zohar* III: 288b.
- 217** Matt 2009 (67): from Gikatilla, *Sha'are Orah*, 44a–b (emphasis added).
- 218** I am indebted to Noah Lubin for this insight.
- 219** McCosker 2008 (3–4).
- 220** Psalm 38: 4.
- 221** Smolin 2013 (97).
- 222** Cusanus 1985, I, 1, §3.
- 223** Kaminsky & Towler 2011 (281–2).
- 224** Steiner 1991 (143).

225 Drob 1997.

226 *ibid.*

227 Drob himself (*ibid*) makes this connexion.

228 Kolakowski 1985 (64).

229 Teilhard de Chardin 1960 (99). Cf Stephen Batchelor 2016 (231): ‘The mystical does not transcend the world but saturates it’.

230 Genesis 28:16.

231 Eckhart, Sermon (Pfeiffer) LXXXII: 1931–47, vol 1 (206).

232 The physical universe of measurement is incommensurate with the universe of consciousness. So Eckhart: ‘The least of the powers of my soul is wider than the expanse of heaven’: Sermon (Pfeiffer) XXIX: 2009 (178).

233 That is of course a matter of debate, but I believe the effects of religion overall outweigh whatever is alleged against it, a topic that would require, and has had, dispassionate book-length treatment: see, eg, Shortt 2019a, entitled *Does Religion Do More Harm Than Good?*

234 This is how it is normally rendered. However, Eckhart writes: ‘If anyone were to rob God of loving the soul, he would rob Him of His life and being, or he would kill God, if one may say so; for the self-same love with which God loves the soul is His life...’ Sermon (Pfeiffer) XLII: 2009 (234). This translation follows the German more closely than the Evans [1857] translation I have used elsewhere: » *Der daz gote benæme, daz er die sêle niht enminnete, der benæme im sîn leben und sîn wesen, oder er tôte got, ob man daz sprechen sölte; wan diu selbe minne, dâ mite got die sêle minnet, daz ist sîn leben.* «

235 Eckhart, Sermon (Pfeiffer) V: 1931–47, vol 1 (62). See also: ‘God can no more do without us than we without Him, for even if we were able to turn from God, God still could not turn from us ... he is of such nature and essence that he *must* give. He who would deprive God of this would deprive him of his own being, of his very life’: Sermon (Pfeiffer) XI: 2009 (98).

236 Heidegger 1975a (9).

237 Heidegger 1975c, Epilogue to ‘The thing’ (186).

238 Cf Nietzsche 2012 (4): ‘the pride connected with knowing and sensing lies like a blinding fog over the eyes and senses of men’.

239 Whitehead 1938 (121).

240 Masuda & Nisbett 2001 (emphasis in original). See also Miyamoto, Nisbett & Masuda 2006; Masuda, Wang, Ito *et al* 2012.

241 Schelling, ‘Hegel’: 1966 (163: emphasis in original): » *Die ganze Welt liegt gleichsam in den Netzen des Verstandes oder der Vernunft, aber die Frage ist eben, wie sie in diese Netze gekommen sei, da in der Welt offenbar noch etwas anderes und etwas mehr als bloße Vernunft ist, ja sogar etwas über diese Schranken Hinausstrebendes.* «

242 Sinclair 1876 (382): ‘It is generally, although erroneously, supposed that the doctrine of the Trinity is of Christian origin. Nearly every nation of antiquity possessed a similar doctrine. St Jerome testifies unequivocally, “All the ancient nations believed in the Trinity”’. An image of the Trinity that helps me is that of a book. What is the book? Is it what was present in the mind of its writer? Or the tangible volume on the table in front of me? Or what goes on in the mind of the receptive reader? Clearly it is each and all.

243 I refer to the ‘*filioque* clause’. The original creed, compiled in the fourth century by the First Council of Constantinople, asserts that the Holy Spirit emanates from God the Father. The Western Church from the eleventh century added the phrase *filioque*, ‘and from the Son’.

244 Moltmann 1993 (98).

245 McGilchrist 2009b (314–29).

246 For an illuminating account, see Shiloah 1997.

247 Roy 1994 (83).

248 Foster 2012 (159).

249 Gambetta & Hertog 2009. Reductionists tend to rely heavily on engineering metaphors when attempting to understand living organisms.

250 Quoted in the frontispiece of *The Captive Mind* (Miłosz 1955).

251 Kierkegaard 1988 (119).

252 Grayling 2009/10.

253 Rée 2013. Grayling certainly loves certitude. In a piece entitled ‘Probably a ridiculous caveat’, about the ‘atheist bus campaign’ (to which the last sentence of Rée’s piece above obliquely refers), Grayling wrote: ‘I was not happy about the word “probably” in the slogan “There is probably no God”. I would question the rationality of anyone who thought that there is probably no Father Christmas, or probably no fairies at the bottom of the garden, etcetera, and since such beliefs and beliefs in the gods of Olympus and Ararat and all other religions are on a par, there is no “probably” about it’ (Grayling 2009). The campaign, backed by Richard Dawkins and The British Humanist Association, took place in 2008–9, and involved advertisements on public transport stating: ‘There’s probably no god. Now stop worrying and enjoy your life.’ The assumption that God must interfere with the enjoyment of life is odd (though God might consider really spoiling your fun in an afterlife, I suppose). As Harold Bloom put it, ‘It’s no fun being an atheist’ (Bloom 2005). The evidence appears to be, by contrast, that religious people are very considerably happier, healthier, both physically and mentally, less lonely, more fulfilled and longer-lived than others (see Klein, Keller, Silver *et al* 2016). Not, of course, that that is a sufficient reason for believing.

254 Harris 2005.

255 *ibid.*

256 *ibid.*

257 Bacon, ‘Of Atheism’, 1902 (38–41: 40).

258 Russell 1952.

259 Stump 2010 (25).

260 James 1902 (35).

261 Although some people who do not identify as atheists want to include themselves among ‘Brights’, the history of the term clarifies its import. According to Wikipedia, Paul Geisert, who coined the term ‘Bright’ and co-founded the Bright Movement, is a one-time Chicago biology teacher, professor, entrepreneur and writer of learning materials. In deciding to attend the Godless Americans March on Washington in 2002, Geisert disliked the label ‘godless’ because he thought it would alienate the general public to whom that term was synonymous with ‘evil’. He sought a new, positive word that might become well-accepted and improve the image of those who did not believe in the supernatural, in the same way that the term ‘gay’ did. A few weeks later, Geisert came up with the noun ‘bright’ after brainstorming lots of ideas. He then ran into another room and told his wife: ‘I’ve got the word, and this is going to be big!’ Their self-identified numbers include Richard Dawkins, Steven Pinker and Daniel Dennett: en.wikipedia.org/wiki/Brights_movement.

262 Steiner 2004 (2).

263 *ibid* (4–5: emphasis in original).

264 Cf Schiller 1891 (268): ‘It is a mistake to suppose that all things require to be proved, for proof is an activity of thought, and thought does not constitute the whole of consciousness. A fact may be as surely attested by feeling or will, as by the most rigorous demonstration, and ultimately all demonstration rests on such self-evident facts’.

265 Huxley 1893 (245).

266 Steven Pinker calls it ‘timely and important’ and ‘superb’, and says that it is ‘clear and gripping, and should be read by anyone interested in the tension between science and religion’; Richard Dawkins calls it ‘outstandingly good’, and says ‘it’s hard to see how any reasonable person can resist the conclusions of his superbly argued book’; and Sam Harris calls it ‘a profound and lovely book [that] should be required reading at every college on earth’.

267 Hudson 1968 (58).

268 Coyne 2016 (55).

269 Niels Bohr.

270 Coyne *op cit* (29).

271 See the argument of Chapter 15 throughout.

272 Coyne *op cit* (64).

273 Bacon 1857 (355).

274 Coyne *op cit* (257).

275 Popper 1978 (emphasis in original).

276 Sagan 2006 (221).

277 Schlegel 1991, §54.

278 See, eg, Russell 1991; and Ronchi 2014.

279 Hart 2013 (65).

280 Gould 1992.

281 Although some scientists dismiss ‘scientism’ as a contentless term, or ‘boo word’, it is not: McGilchrist 2013.

282 Scruton 2013 (46: emphasis in original).

283 Popper 1978.

284 Dawkins 2003 (198).

285 Medawar 1988 (66).

286 Shalev 2002 (57–61). Religious beliefs are broken down into 25 categories, though these include Buddhism (1.2%) and neo-paganism (0.2%), which though treated as religions, are not conventionally associated with the idea of God. (However, on Buddhism, see Shaku 2017 (25): ‘At the outset, let me state that Buddhism is not atheistic as the term is ordinarily understood. It has certainly a God, the highest reality and truth, through which and in which this universe exists.’) On everyday scientists, see 2009 Pew Research Center poll: 48% describe themselves as ‘atheist, agnostic or nothing in particular’.

287 Elmhirst 2015.

288 Norenzayan, Gervais & Trzesniewski 2012. See Appendix 8 for further discussion of this point.

289 Commenting on Coyne 2016, according to the latter’s publisher’s blurb.

290 Muller 2016 (287).

291 Gaisman 2018.

- 292** Gould 1997.
- 293** Huxley 1959a (26).
- 294** Gleiser 2014 (xiii–xiv).
- 295** Berger 1999 (10).
- 296** Hart 2013 (46).
- 297** Front matter of Coyne 2016.
- 298** McGinn 2001 (1 & 14).
- 299** Shogaku Shunryū Suzuki-rōshi, ‘There must always be differences in our bodily experiences and feelings’, delivered Sunday, 30 March 1969; included, in edited form, in Suzuki 2002 (59).
- 300** Blake, *The Marriage of Heaven and Hell*, Plate 7, ‘Proverbs of Hell’.
- 301** Otto 1917.
- 302** Müller 1885, vol 1, 391–448, ‘The theoretical stage, and the origin of language’ (434–5).
- 303** Underhill is referring to *The Four Degrees of Passionate Charity*, also translated as *The Four Degrees of Violent Love*, written in or around the year 1170 by Richard of St Victor, a Scottish philosopher and mystic who was one of the Victorines, a group of scholars gathered round the Abbey of St Victor in Paris.
- 304** Letter of Underhill to Marjorie Robinson, 13 October 1909; in Poston 2010 (162).
- 305** Lewis 1988 (23–4).
- 306** Sermon (Pfeiffer) LXIX: 1931–47, vol 1, 171.
- 307** Hart 2017.
- 308** Watts 1989 (8–9: emphasis in original).
- 309** Greisman & Ritzer 1981.
- 310** Bishop 2012 (emphasis added).
- 311** Freud 1933 (112); Jung, ‘Psychological types’ (1923): 1953–79, vol 6 (510–23: emphasis added).
- 312** Vergely 2010 (112).
- 313** Quinn 2002 (25).
- 314** Midgley 1989 (41: emphasis added). Cf Paul Hawken, Commencement Address to the Class of 2009, University of Portland, 3 May 2009: ‘Ralph Waldo Emerson once asked what we would do if the stars came out only once every thousand years. No one would sleep that night, of course. The world would create new religions overnight. We would be ecstatic, delirious, made rapturous by the glory of God. Instead, the stars come out every night and we watch television.’
- 315** Curry 2018. See further Curry 2017.
- 316** Tudge 2013 (156).
- 317** Hegel 1977, §665. More precisely: ‘No man is a hero to his valet, not, however, because the hero is not a hero, but because the valet is – the valet, with whom the hero has to do, not as a hero, but as a man who eats, drinks, and dresses’.
- 318** *Tao Te Ching*, §1 (trans UK Le Guin).
- 319** Lewis 2017 (19).
- 320** Lewis 2017 (205).
- 321** Lewis 2015 (150–1).

322 Lewis 1988 (20).

323 Berlin 1999 (104): ‘When Novalis was asked where he thought he was tending, what his art was about, he said “I am always going home, always to my father’s house” ... attempts to go back, to go home to what is *pulling* and *drawing* him, the famous *Sehnsucht* of the romantics, the search for the blue flower, as Novalis called it.’

324 Cioran 1949: « *échelle de larmes sur laquelle gravissent nos désirs de Dieu* ».

325 Gray 2018.

326 Habermas 2006 (151).

327 Read 2011 (99).

328 Fish 2010.

329 *ibid.*

330 Rowson 2014. Formerly the Royal Society of Arts, the RSA now styles itself by its initials only, referring to its history as ‘the royal society for arts, manufactures and commerce’ and commitment to ‘a future that works for everyone. A future where we can all participate in its creation’ (www.thersa.org/about).

331 Smith & Denton 2005 (165).

332 assets.ngin.com/attachments/document/0042/5177/ NationalStudyYout_Religion.pdf (accessed 15 March 2021).

333 *ibid.*

334 Smith *et al*, *op cit* (164).

335 Solzhenitsyn 1983.

336 Gaisman 2018.

337 Letter of James to Frances Rollins Morse, 12–13 April 1900; in H James, 1920, vol 2 (127).

338 Letter of Keats to George and Georgiana Keats, 14 February–3 May 1819: 1970 (249: emphasis added).

339 Tudge 2013 (156).

340 Pascal 1976, §187 (Lafuma §12): « *Les hommes ont mépris pour la religion. Ils en ont haine et peur qu’elle soit vraie.* »

341 Frankl 2019 (50–1).

342 From ‘Eins und Alles’: » *Wirkt ewiges lebendiges Tun ... Es soll sich regen, schaffend handeln, / Erst sich gestalten, dann verwandeln; / Nur scheinbar steht’s Momente still. / Das Ewige regt sich fort in allen: / Denn alles muß in Nichts zerfallen, / Wenn es im Sein beharren will* « – ‘An eternal living force ... that cannot but move, cannot but act to create, first to form, and then to transform, itself; its moments of rest are only apparent. The eternal presses onward in all things: for all that is to persist in being must dissolve to nothing.’

343 Eliade 1978 (205–7).

344 From ‘Die selige Sehnsucht’: » ... *so lang du das nicht hast, / Dieses: Stirb und werde! / Bist du nur ein trüber Gast / Auf der dunklen Erde.* « Goethe’s expression is compressed and has foxed translators. My translation is not quite literal, but I believe it is as close as can be managed while capturing Goethe’s meaning.

345 Drob 2009 (130–1).

346 Zohar II: 173b: in Lachower & Tishby 1991, vol 2 (468).

347 Shakespeare, *As You Like It*, Act II, sc I, lines 14–19.

348 Cilliers 1998 (94–5).

349 Nietzsche 2001, §338 (192: emphasis in original).

350 Le Guin 1973. The idea was prompted by a famous passage in William James’s lecture of 1891, ‘The moral philosopher and the moral life’ (James 1897, 184–215).

351 Sikka 1994 (426): ‘Evil is thus nothing merely negative. It is positive discord, arising when the part strives to be the whole, when a particular will opposes itself to the universal will by seeking to be the creative ground of all reality. It then seeks to usurp the place of God, who is that ground, and does so by perversely asserting its own existence in opposition to, rather than in harmony with, the existence of other natures and other beings. It is not limitation that is evil, then, but the refusal, on the part of a finite being, to accept limitation’.

352 Jung 1961 (235).

353 Calder 2018.

354 According to the *Zohar* (I: 205a), God ‘made a Right and a Left for the ruling of the world. The one is called “good”, the other “evil”, and he made man to be a combination of the two.’

355 Watts 1963 (9). See also Wilber 2001 (30).

356 Drob 2000. The resonances with the Japanese concept of *kintsugi* are impossible to ignore (see Plate 22[c]). That one is a spiritual concept and the other an aesthetic concept should not, of itself, perturb a reader who has accompanied me this far.

357 *ibid.*

358 This is also the message of *I Ching*: that the Creative and the Receptive must work together, but always with the Receptive serving the Creative. ‘For the Receptive must be *activated and led* by the Creative; then it is productive of good. *Only when it abandons this position and tries to stand as an equal* side by side with the Creative, does it become evil. The result then is opposition to and struggle against the Creative, which is productive of evil to both.’ *I Ching* 1968 (11), commentary on hexagram 2: K’un. I am grateful to Stephen Lowy for bringing this, and the other references to *I Ching* that follow, to my notice.

359 Cottingham 2020 (153).

CODA TO PART III

- 1 Smolin 2008 (22).
- 2 Anderson 1972 (393).
- 3 Stephens 2020, referring to Burchett, Elek, Tejos *et al* 2020.
- 4 Smolin 2013 (xxx).

EPILOGUE

1 Percy 1983 (76).

2 Hexagram 12: P'i – Stagnation (the exact opposite of hexagram 11: T'ai – Peace). Commentary on the Decision: 'Evil people of the time of standstill do not further the perseverance of the superior man. The great departs; the small approaches. Thus heaven and earth do not unite, and all beings fail to achieve union. Upper and lower do not unite, and in the world, states go down to ruin. The shadowy is within, the light without; weakness is within, firmness without; the inferior is within, the superior without. The way of the inferior is waxing, the way of the superior is waning' (trans R Wilhelm).

3 Benjamin 1995 (650).

4 For one another, see McGilchrist 2009b (esp 434–6); for a divine realm, see Appendix 8, section 4.

5 *The Secret of the Golden Flower*, Bk II, §5: 1991 (14).

6 Commentary on the above: 1991 (78). (Cleary correctly uses the less familiar Chinese term 'Chan' for what the reader will probably know by its Japanese appellation, 'Zen'. I have changed the term in the interests of a readier understanding.) I am grateful to Professor Kenneth Wilson for bringing this passage to my attention.

7 *ibid.*

8 *The Secret of the Golden Flower*, 'Translator's afterword': 1991 (138–9: emphasis added).

9 Heidegger 1975a (8).

10 Rigid views, regardless of political orientation to right or left, are associated with extreme cognitive inflexibility (Zmigrod, Rentfrow & Robbins 2020).

11 Bohm 1994 (10–11: emphasis in original).

12 *ibid* (55).

13 Williams, Dunning & Kruger 2013: 'In 6 studies, participants completed tests involving logical reasoning, intuitive physics, or financial investment. Those more consistent in their approach to the task rated their performances more positively, including those consistently pursuing the wrong rule. Indeed, completely consistent but wrong participants thought almost as highly of their performance as did completely consistent and correct participants. Participants were largely aware of the rules they followed and became more confident in their performance when induced to be more systematic in their approach, no matter how misguided that approach was.'

14 Wilhelm & Wilhelm 1995 (75: emphasis added).

15 Schrödinger, writing in July 1918; quoted in Moore 1992 (113).

16 Elias 1991 (32–3).

17 Frankl 2019 (55).

18 Frank 1946 (emphasis in original).

19 According to Idries Shah, 'it also appears in Rumi's work and again and again in oral legends of Jesus, of which there are a large number.' In a tale of the Sufi dervishes, Isa (Jesus) is besieged by some followers who beg from him the secret name by which Isa restored the dead to life. Not being fitted for such knowledge, they 'make a trial' of the Word on a heap of bleached bones in the desert: immediately a ravenous wild beast comes to life and tears them to shreds (Shah 2016, 138–9).

20 Dimond 1979c (216: emphasis added).

21 Bohm 1994 (3–6: emphasis in original).

22 That is to say, knowledge as understood by the left hemisphere.

23 Rilke, *Die Sonette an Orpheus*, II, 10; and it carries on: ‘But existence is still enchanted for us; it wells up in a hundred places. A play of pure forces, that no one can touch who does not kneel and adore. Words falter, in delicacy, before the ineffable ... And music, ever new, builds from the most tremulous stones, in space that can never be made useful, its divinely hallowed home.’

Alles Erworbene bedroht die Maschine, solange

sie sich erdreistet, im Geist, statt im Gehorchen, zu sein.

Daß nicht der herrlichen Hand schöneres Zögern mehr prange,

zu dem entschlossenern Bau schneidet sie steifer den Stein.

Nirgends bleibt sie zurück, daß wir ihr ein Mal entrönnen

und sie in stiller Fabrik ölend sich selber gehört.

Sie ist das Leben, – sie meint es am besten zu können,

die mit dem gleichen Entschluß ordnet und schafft und zerstört.

Aber noch ist uns das Dasein verzaubert; an hundert

Stellen ist es noch Ursprung. Ein Spielen von reinen

Kräften, die keiner berührt, der nicht kniet und bewundert.

Worte gehen noch zart am Unsäglichen aus ...

Und die Musik, immer neu, aus den bebendsten Steinen,

baut im unbrauchbaren Raum ihr vergöttlichtes Haus.

24 Lawrence 1980 (207: emphasis added).

25 Lawrence 1961 (202).

26 Chargaff 1976

27 Depression: see Wood & Joseph 2010; mortality: see meta-analysis of 62 papers, studying a total of 1,259,949 subjects, by Martín-María, Miret, Caballero et al 2017; and more recently Becchetti, Bachelet & Pisani 2019; lateralisation: while hedonic happiness shows no significant lateralisation, eudaimonic happiness is, as expected, more dependent on the right hemisphere (Costa, Suardi, Diano et al 2019; Lewis, Kanai, Rees et al 2014).

28 Hofstede 2011.

29 See McGilchrist 2009b (434ff) for references.

30 Stevenson & Wolfers 2009.

31 Report of the Office of National Statistics, ‘Suicides in the UK: 2018 registrations’, 3 September 2009.

32 Rates of depression differ markedly between cultures, probably by as much as 12-fold, and such differences in rates of depression appear to be linked to the degree of stability and interconnectedness within a culture (Weissman, Bland, Canino et al 1996). In *The Master and his Emissary*, I cited by way of illustration the fact that rates of psychological disturbance in Mexican immigrants to the USA start at a low level, but increase in proportion to the time spent in the US. The lifetime prevalence of any mental disorder in one large study was 18% for Mexican immigrants with less than 13 years in the US, 32% for those with more than 13 years, but only for those born in the US did it approximate, at 49%, the national rate for the whole US (Vega, Kolody, Aguilar-Gaxiola 1998). What is

particularly striking is that, in a Swedish study, refugees are no more likely to attempt suicide than non-refugee migrants, and both have markedly lower rates of attempted suicide than the native population. Only with progressive acculturation do they begin to approach levels in Swedish natives (Hollander, Pitman, Sjöqvist *et al* 2020; Björkenstam, Helgesson, Amin *et al* 2020: see also Norredam, Olsbjerg, Petersen *et al* 2013; Di Thiene, Alexanderson, Tinghög *et al* 2015. Similar findings obtain in the US (Nasseri & Moulton 2011) and Canada (Kliewer & Ward 1988).

33 Twenge, Gentile, DeWall *et al* 2010.

34 Brooks 2018.

35 www.cigna.com/assets/docs/newsroom/loneliness-survey-2018-full-report.pdf (accessed 15 March 2021).

36 Webster Rudmin, Ferrada-Noli & Skolbekken 2003; Greenberg, Carey & Popper 1985; Kearl & Harris 1981; Lester 1997; Rangaswami 1996; Sinha 1988; Stack 1993.

37 Durkheim 1951.

38 Interestingly, schizophrenic subjects, who show a pattern of right hemisphere deficits, can recognise happiness or anger, but not sorrow, in another's face: Bonfils, Haas & Salyers 2019; Bonfils, Ventura, Subotnik *et al* 2019.

39 There are almost insuperable difficulties in localising the correlates of *Lebenswerte*. I know of only one, an ingenious experiment involving subjects with a phobia for snakes bringing a live snake in close proximity to their head while in a scanner – a reasonable proxy for courage – which found that the brain correlates were principally in the right hemisphere (Nili, Goldberg, Weizman *et al* 2010).

40 See McGilchrist 2009b (436–8).

41 Just walking in a forest has been shown reliably to reduce blood pressure, lower blood cortisol, strengthen immunity, and promote muscle relaxation, as well as bringing about improvements in subjective well-being, confidence and social relationships: Ives, Abson, von Wehrden *et al* 2018; Tsunetsugu, Park, Ishii *et al* 2007; Hansen, Jones & Tocchini 2017; Ideno, Hayashi, Abe *et al* 2017; Chang, Hammitt, Chen *et al* 2008; Berman & Anton 1988; Polenz & Rubitz 1977; Richardson, Cormack, McRobert *et al* 2016; Capaldi, Dopko & Zelenski 2014; Pretty 2004; Bowler, Buyung-Ali, Knight *et al* 2010; DE Aldous 2007. In one study of subjects with major depressive disorder, the effects of locale on cognitive-behavioural therapy were compared; only 5% of the control (no-treatment) group achieved remission over a four-week period, while 21% achieved remission with CBT delivered in a hospital. However, this compared with 61% of those treated in a forest setting (Kim, Lim, Chung *et al* 2009). Disconnexion from nature may lie behind a number of psychological ills of modern urban life, especially when combined with the exhaustion induced by constant artificial stimulation. Spending time in nature heals stress and causes restoration after mental fatigue: see Berto 2014 for a review. In particular, see Hartig, Evans, Jamner *et al* 2003; Ulrich, Simons, Losito *et al* 1991. It also reduces anger, aggression and fear: Ulrich 1979; Ulrich, Simons, Losito *et al* 1991; Kuo & Sullivan 2001. By contrast environments devoid of natural elements can produce anxiety, anger, and frustration: Coss 1991; Ulrich 1993. Scenes with natural landscapes produce more positive emotional effects than urban scenes with inanimate objects: Lohr & Pearson-Mims 2006. Hospital patients have better outcomes on a wide range of measures if their windows overlook trees rather than a manmade environment: Ulrich 1984; Diette, Lechtzin, Haponik *et al* 2003; Miller, Hickman & Lemasters 1992. Prisoners' health is better if their cell windows include views of farmland and trees: Moore 1981. Natural settings increase performance on tasks requiring attention and cognitive processing: in an urban setting attention is constantly aggressively captured, requiring immediate directed attention, even if only so as to avoid traffic: Berman, Jonides & Kaplan 2008; Felsten 2009; Tennessen & Cimprich 1995; Berto 2005; Kaplan & Kaplan 1989. This causes fatigue, an impoverished capacity for global attention and increased stress. It also leads ultimately to the

inability to focus, with more frequent performance errors, an inability to plan, loss of social civility and increased irritability: Kaplan 1995. A study of girls living in the same housing complex found that being in or near a natural setting increased self-control and self-discipline, improved the ability to concentrate and to delay gratification, and decreased impulsiveness: Taylor, Kuo & Sullivan 2002. Interestingly blue and green space, but blue space in particular, embodies important therapeutic qualities for older adults, which may explain why so many retire by the sea: Finlay, Franke, McKay 2015.

42 See Goethe, note 5142 above.

43 Montaigne, 'On experience' (trans M Screech): « *Laissons faire un peu à nature: elle entend mieux ses affaires que nous.* »

44 Dr Lukas Fierz, private communication. In keeping with my view that many of the phenomena of modernism reflect the culture's broader imbalance in favour of the left hemisphere (how could they avoid doing so?), Le Corbusier stated: « *L'homme marche droit parce qu'il a un but ; il sait où il va. Il a décidé d'aller quelque part et il y marche droit.* » – 'Man walks in a straight line because he has a goal; he knows where he is going. He has made up his mind to go to some particular place and he goes straight to it' (1922, 33).

45 Schelling 1985, vol 3 (629): » *Wo das Licht jener Offenbarung schwand, und die Menschen die Dinge nicht aus dem All, sondern aus einander, nicht in der Einheit, sondern in der Trennung erkennen, und ebenso sich selbst in der Vereinzelung und Absonderung von dem All begreifen wollten: da seht ihr die Wissenschaft in weiten Räumen verödet, mit großer Anstrengung geringe Fortschritte im Wachsthum der Erkenntniß, Sandkorn zu Sandkorn gezählt, um das Universum zu erbauen; ihr seht zugleich die Schönheit des Lebens verschwunden, einen wilden Krieg der Meinungen über die ersten und wichtigsten Dinge verbreitet, alles in Einzelheit zerfallen.* «

46 Sperry 1973 (209).

47 Sperry 1974b (7 & 9).

48 Fox 2011 (1).

49 Scheler 1954 (261): » *Jeder endliche Geist glaubt entweder an Gott oder an einen Götzen* «. It may be argued that Buddhism acknowledges no God; once again I would quote Shaku: Buddhism 'has certainly a God, the highest reality and truth, through which and in which this universe exists.' This is also the God of the Taoists.

50 Heschel 2005 (3).

51 Angelus Silesius, 'Beschluss', from *Cherubinischer Wandersmann*, 1657: » *Freund, es ist auch genug. Im Fall du mehr willst lesen, / So geh und werde selbst die Schrift und selbst das Wesen.* «

APPENDIX 4

1 See Ratcliffe 2015 (148).

2 *ibid* (150).

3 *ibid* (151). These ideas derive from Bergson.

4 Kornbrot, Msetfi & Grimwood 2013.

5 Mundt, Richter, van Hees *et al* 1998; Lewis 1932; Wyrick & Wyrick 1977; and Kitamura & Kumar 1982.

6 Schmidt 1987 (115).

7 Sass & Pienkos 2013b (122).

8 Jackson 1986 (383–404).

9 This is primarily from my own experience and that of my patients, but there is research that confirms it: Bubl, Kern, Ebert *et al* 2010; Bubl, Tebartz Van Elst, Gonda *et al* 2009. See also McGilchrist 2017 (2–5). As we know, depression is associated with the right hemisphere, and with the colour blue. There is a possibility that the left hemisphere prefers red, a colour favoured by people who are manic or hypomanic: Pettigrew 2001 (94); and McGilchrist 2009b (63 & 474).

10 Goethe 2006, §§779–84 (171).

11 Sass & Pienkos 2013c (140).

12 See Chapter 9.

13 For further discussion of the asymmetrical, non-dipolar, relationship between schizophrenia and depression and how they may relate, see my discussion of the matter in relation to the philosophy of Max Scheler: McGilchrist 2009a. Here I part company from Cutting, who sees a more symmetrical, dipolar, relationship between the conditions. Since the right frontal pole of the brain is in a dynamic equilibrium with its own (right) posterior cortex, on the one hand, and with the contralateral (left) frontal pole, on the other, depression is usually associated with hypofunction of either of those two areas, and its resolution with recovery of function in them. In hemisphere terms, therefore, the situation with regard to depression is not straightforward. For a more thorough exploration of this complex area in terms of laterality, see McGilchrist 2009b (62–4).

14 Cutting 2002 (158: emphasis added).

15 Tatossian 1997 (56 & 62). And see O'Connor, Berry, Lewis *et al* 2007.

16 Plate 6[b].

17 Cutting, Moreira, Naudin *et al* 2017.

18 Tatossian *op cit* (56).

19 *ibid* (62).

20 For further discussion, see McGilchrist 2009a.

APPENDIX 5

- 1 Hecht 2014.
- 2 Steckler, Hamlin, Miller *et al* 2017.
- 3 Tankersley, Stowe & Huettel 2007; Montague & Chiu 2007; Morishima, Schunk, Bruhin *et al* 2012. However, things are more complex than they might seem, since right prefrontal cortex is also differentially activated when people make independent-minded, rather than interdependent-minded, assertions (Wang, Peng, Chechacz *et al* 2017). This may be because of the right hemisphere's contribution to the sense of the self as moral agent, which becomes more obvious when thinking or acting independently.
- 4 Tassy, Oullier, Duclos *et al* 2012; Greene, Nystrom, Engell *et al* 2004.
- 5 Moll, de Oliveira-Souza, Eslinger *et al* 2002.
- 6 Knoch, Pascual-Leone, Meyer *et al* 2006.
- 7 Singer, Seymour, O'Doherty *et al* 2006.
- 8 Baumgartner, Knoch, Hotz *et al* 2011; Knoch, Pascual-Leone, Meyer *et al* 2006; Knoch, Nitsche, Fischbacher *et al* 2008; van't Wout, Kahn, Sanfey *et al* 2005; Knoch, Gianotti, Baumgartner *et al* 2010.
- 9 Miller, Sinnott-Armstrong, Young *et al* 2010.
- 10 Young, Camprodon, Hauser *et al* 2010; Young, Cushman, Hauser *et al* 2007.
- 11 See McGilchrist 2009b (84–7).
- 12 Richardson, Malloy & Grace 1991.
- 13 Schultheiss, Riebel & Jones 2009.
- 14 Banich & Depue 2015.
- 15 Yücel, Fornito, Youssef *et al* 2012.
- 16 Fujita & Carnevale 2012; Chiou, Wu & Chang 2013.
- 17 Malkoc, Zauberaman & Bettman 2010.
- 18 Knoch & Fehr 2007; Alonso-Alonso & Pascual-Leone 2007.
- 19 Kuhl & Kazén 2008; Quirin, Meyer, Heise *et al* 2013; Quirin, Gruber, Kuhl *et al* 2013. For review, see Hecht 2014.
- 20 Hein, Lamm, Brodbeck *et al* 2011.
- 21 Jackson, Brunet, Meltzoff *et al* 2006.
- 22 Kuhl *et al*, *op cit*.
- 23 Schore & Marks-Tarlow 2019 (155).
- 24 Mychack, Kramer, Boone *et al* 2001. See also Mendez & Shapira 2009.
- 25 Chan, Anderson, Pijnenburg *et al* 2009.
- 26 Langevin, Ben-Aron, Coulthard *et al* 1985; Litman 2004; Hucker, Langevin, Dickey *et al* 1988.
- 27 Schultheiss 2018.
- 28 Whittle, Yücel, Fornito *et al* 2008.

- 29** Nestor, Nakamura, Niznikiewicz *et al* 2013; Kapogiannis, Sutin, Davatzikos *et al* 2013.
- 30** Yanagisawa, Masui, Furutani *et al* 2011.
- 31** Zahn, Garrido, Moll *et al* 2014.
- 32** Nestor, Nakamura, Niznikiewicz *et al* 2013.
- 33** Rankin, Rosen, Kramer *et al* 2004; Sollberger, Stanley, Wilson *et al* 2009.
- 34** Mendez 2009; Mendez, Chen, Shapira *et al* 2005; Tranel, Bechara & Denburg 2002.
- 35** Cope, Schaich Borg, Harenski *et al* 2010.
- 36** Hecht 2014.
- 37** Wagner, N'Diaye, Ethofer *et al* 2011; Amodio, Devine & Harmon-Jones 2007; Matsuda, Nittono & Allen 2013.
- 38** Karim, Schneider, Lotze *et al* 2010.
- 39** Müller, Gänssbauer, Sommer *et al* 2008; Müller, Sommer, Döhnelt *et al* 2008; Yang, Raine, Colletti *et al* 2009.
- 40** Scheid 1934. Kretschmer made similar observations.
- 41** Everhart, Demaree & Harrison 2008; Harmon-Jones 2003; Harmon-Jones & Allen 2003; Harmon-Jones & Sigelman 2001; Harmon-Jones 2004; Hiraishi, Haida, Matsumoto *et al* 2012; Kubo, Okanoya & Kawai 2012; Peterson, Gravens & Harmon-Jones 2011; Verona, Sadeh & Curtin 2009.
- 42** Harmon-Jones 2007; Keune, van der Heiden, Várkuti *et al* 2012.
- 43** Hortensius, Schutter & Harmon-Jones 2012; Peterson, Shackman & Harmon-Jones 2008.
- 44** Boes, Tranel, Anderson *et al* 2008.
- 45** Gansler, McLaughlin, Iguchi *et al* 2009.
- 46** Hecht 2011.
- 47** Schultheiss, Riebel & Jones 2009.
- 48** McClelland & Burnham 2003.
- 49** Mason & Blankenship 1987; Schultheiss, Riebel & Jones 2009.
- 50** Schultheiss 2018.

APPENDIX 6

- 1 Zaidel 2013.
- 2 Fischer, Perez, Prasad *et al* 2016.
- 3 Bauer 1982. Interestingly, he also ‘described three unsatisfying sexual encounters since his accident in which he had been unable to achieve erection until he began talking himself into arousal by verbal-auditory means’.
- 4 Habib 1986.
- 5 Sierra, Lopera, Lambert *et al* 2002; and Lopera & Ardila 1992.
- 6 Marianetti, Mina, Marchione *et al* 2011.
- 7 *ibid.*
- 8 Cushing 1922; and Horrax 1923 (apparently reporting the same patient).
- 9 Minkowski 2004 (136).
- 10 See McGilchrist 2009b (74ff); and Marin & Perry 1999; Stewart, von Kriegstein, Warren *et al* 2006; Särkämö, Tervaniemi, Soinila *et al* 2010; Jafaria, Esmaili, Delbari *et al* 2017.
- 11 Hyde, Zatorre, Griffiths *et al* 2006; Hyde, Lerch, Zatorre *et al* 2007; Mandell, Schulze & Schlaug 2007.
- 12 Hyde, Zatorre & Peretz 2010.
- 13 Peretz, Cagnon & Bouchard 1998.
- 14 Satoh, Kato, Tabei *et al* 2016.
- 15 Mazzoni, Moretti, Pardossi *et al* 1993.
- 16 Satoh, Nakase, Nagata *et al* 2011.
- 17 Hirel, Lévêque, Deiana *et al* 2014: « *le patient rapportait spontanément une perte d’intérêt pour la musique, et notamment une perte des émotions qu’il ressentait auparavant lors de l’écoute de la musique.* »
- 18 Mazzucchi, Marchini, Budai *et al* 1982.
- 19 Judd, Arslanian, Davidson *et al* 1979; as quoted in Samson & Zatorre 1994 (296): « *il se plaint de ne plus apprécier la musique comme dans le passé et rapporte spontanément qu’il semble avoir perdu la faculté de ‘créer une gestalt’.* »
- 20 Griffiths, Warren, Dean *et al* 2004.
- 21 Rodway, Schepman, Crossley *et al* 2019.
- 22 Fudali-Czyż, Francuz & Augustynowicz 2018.
- 23 Lacey, Hagtvedt, Patrick *et al* 2011.
- 24 Cattaneo, Lega, Ferrari *et al* 2015.
- 25 Jacobsen, Schubotz, Höfel *et al* 2006.
- 26 *ibid.*
- 27 Lacey, Hagtvedt, Patrick *et al* 2011; Kirk 2008; Kirk, Skov, Hulme *et al* 2009.
- 28 Kirk, Skov, Christensen *et al* 2009.

- [29](#) Rodway, Schepman, Crossley *et al* 2019.
- [30](#) Calvo-Merino, Jola, Glaser *et al* 2008.
- [31](#) Vessel, Starr & Rubin 2012 (emphasis added).
- [32](#) Dowd & Barch 2010.
- [33](#) Ferrari, Lega, Tamietto *et al* 2015.
- [34](#) Tsukiura & Cabeza 2011.
- [35](#) Friedrich, Harms & Elias 2014. See also: Christman & Pinger 1997; Mead & McLaughlin 1992; Beaumont 1985.
- [36](#) Hutchison, Thomas & Elias 2011; McDine, Livingston, Thomas *et al* 2011.
- [37](#) Cela-Conde, Ayala, Munar *et al* 2009.
- [38](#) Bromberger, Sternschein, Widick *et al* 2011.
- [39](#) Brown, Gao, Tisdelle *et al* 2011.
- [40](#) Boccia, Barbetti, Piccardi *et al* 2017.
- [41](#) Heilman, Schwartz & Watson 1978; Morrow, Vrtunski, Kim *et al* 1981: ‘non-dominant hemisphere damage suppresses arousal altogether’.
- [42](#) Craig 2005.
- [43](#) Mizokami, Terao, Hatano *et al* 2014; Calvo-Merino, Urgesi, Orgs *et al* 2010; Cupchik, Vartanian, Crawley *et al* 2009.
- [44](#) Nadal, Schiavi & Cattaneo 2018.
- [45](#) Coney & Bruce 2004.
- [46](#) Kawabata & Zeki 2004; Di Dio, Macaluso & Rizzolatti 2007.
- [47](#) Gao & Guo 2018.
- [48](#) Zeman, Milton, Smith *et al* 2013.
- [49](#) Bohrn, Altmann, Lubrich *et al* 2013.
- [50](#) Cupchik, Vartanian, Crawley *et al* 2009.
- [51](#) Cattaneo, Lega, Flexas *et al* 2014.
- [52](#) Yeh, Lin, Hsu *et al* 2015.
- [53](#) Silveira, Fehse, Vedder *et al* 2015. See, eg, Lutz, Nassehi, Bao *et al* 2013.
- [54](#) Pang, Nadal, Müller *et al* 2013.
- [55](#) Cross, Kirsch, Ticini *et al* 2011.
- [56](#) Bohrn, Altmann, Lubrich *et al* 2013.
- [57](#) Kawabata & Zeki 2004.
- [58](#) Di Dio, Macaluso & Rizzolatti 2007; Vartanian & Goel 2004.
- [59](#) Di Dio *et al*, *op cit*.
- [60](#) Di Dio, Canessa, Cappa *et al* 2011.

APPENDIX 7

- 1 Farb, Segal, Mayberg *et al* 2007.
- 2 Fox, Dixon, Nijeboer *et al* 2016.
- 3 Thomas, Jamieson & Cohen 2014.
- 4 Krippner & Combs 2002.
- 5 Flor-Henry, Shapiro & Sombrun 2017.
- 6 Lehmann, Faber, Achermann *et al* 2001.
- 7 Berkovich-Ohana, Glicksohn & Goldstein 2012.
- 8 Berkovich-Ohana, Glicksohn & Goldstein 2014.
- 9 Lazar, Kerr, Wasserman *et al* 2005.
- 10 Leung, Chan, Yin *et al* 2013.
- 11 Hölzel, Carmody, Vangel *et al* 2011; Hölzel, Lazar, Gard *et al* 2011; Hölzel, Ott, Hempel *et al* 2007; Luders, Kurth, Mayer *et al* 2012.
- 12 Luders, Toga, Lepore *et al* 2009; Luders, Clark, Narr *et al* 2011.
- 13 Hölzel, Carmody, Vangel *et al*, *op cit*.
- 14 Johnstone & Glass 2008.
- 15 Newberg, Alavi, Baime *et al* 2001; Newberg, Pourdehnad, Alavi *et al* 2003.
- 16 Trimble 2007.
- 17 McNamara 2009.
- 18 Devinsky & Lai 2008.
- 19 McNamara *op cit* (xiii).
- 20 Trimble & Freeman 2006; Devinsky *et al*, *op cit* 2008.
- 21 McNamara 2009 (xi).
- 22 It is of interest that Swedenborg's capacity for clairvoyance, hearing angelic voices, and seeing visions all came to a sudden end three months before he died, immediately after he suffered what would appear to have been a non-dominant hemisphere stroke. Though he was still quite able to speak, 'his spiritual sight of nearly 30 years was entirely gone': Wulff 1996 (108). Thanks to David Lorimer for bringing this to my notice.
- 23 See Chapter 4.
- 24 Puri, Lekh, Nijran *et al* 2001.
- 25 Wuerfel, Krishnamoorthy, Brown *et al* 2004.
- 26 Butler, McNamara & Durso 2011.

APPENDIX 8

1 Heisenberg 2001 (107, 111 & 25; emphasis added): » *Aber man muß sich doch vor allem darüber klar sein, daß in der Religion die Sprache in einer ganz anderen Weise gebraucht wird als in der Wissenschaft. Die Sprache der Religion ist mit der Sprache der Dichtung näher verwandt als mit der Sprache der Wissenschaft... es gehört zu ihren wichtigsten Aufgaben, in ihrer Sprache der Bilder und Gleichniße an den großen Zusammenhang zu erinnern ... Wir wissen, daß es sich bei der Religion um eine Sprache der Bilder und Gleichniße handeln muß, die nie genau das darstellen können, was gemeint ist ... Aber letzten Endes setzt sich doch wohl immer die zentrale Ordnung durch, das, Eine, um in der antiken Terminologie zu reden, zu dem wir in der Sprache der Religion in Beziehung treten.* «

2 Planck 1944: » *Nicht die sichtbare, aber vergängliche Materie ist das Reale, Wahre, Wirkliche, sondern der unsichtbare, unsterbliche Geist ist das Wahre! ... so scheue ich mich nicht, diesen geheimnisvollen Schöpfer so zu benennen, wie ihn alle Kulturvölker der Erde früherer Jahrtausende genannt haben: Gott. So sehen Sie, meine verehrten Freunde, wie in unseren Tagen, in denen man nicht mehr an den Geist als den Urgrund aller Schöpfung glaubt und darum in bitterer Gottesferne steht, gerade das Winzigste und Unsichtbare es ist, das die Wahrheit wieder aus dem Grabe materialistischen Stoffwahnnes herausführt und die Türe öffnet in die verlorene und vergessene Welt des Geistes.* «

3 Einstein 1999 (29).

4 Statement to the German anti-Nazi diplomat Hubertus zu Löwenstein around 1941, as quoted in Löwenstein 1968.

5 McElroy 2004 (118).

6 Wang 1996 (104–5).

7 Wang 1987 (150).

8 *ibid* (2).

9 Wigner 1967 (261).

10 Macrae 1992 (379).

11 Eccles 1984 (50).

12 Miller 2017.

13 He demonstrated the impossibility of squaring the circle, finally proven by Ferdinand von Lindemann in 1882 (*De circuli quadratura*, 1450); saw that the earth is not the centre of the universe, is not at rest, but moves round the sun, and that its poles are not fixed, as well as realising that the celestial bodies are not strictly spherical, nor their orbits circular (see Bond 1997); believed the stars were other suns that had other worlds orbiting them, and that space was infinite (*ibid*); published improvements to the Alfonsine Tables which gave a practical method to find the position of the sun, moon and planets; contributed to the development of the concepts of infinitesimal and relative motion – his writings were instrumental for Leibniz’s development of calculus (Priday 2019 (88–9)); is credited with having conducted the first modern formal biology experiment, concluding that plants absorb nourishment from the air and water – this some 150 years before van Helmont (Lieth & Whittaker 1975, 8; Krikorian & Steward 1968); and was the first to see the value of counting, rather than merely characterising, the pulse, which he proposed by weighing the quantity of water run out of a water clock while the pulse beat 100 times (Hoff 1964). Although he is sometimes credited with

being the first to use concave lenses to correct myopia, this would appear to be an overstatement (*De Beryllo*, 1458).

14 Osserman 1995.

15 Russell 1997 (emphasis in original).

16 Russell 1991 (6).

17 Russell 1997.

18 Numbers 2009.

19 Danielson 2001 (1031).

20 Moses Maimonides 1919 (118–9).

21 Al-Biruni 1934 (45).

22 Danielson *op cit* (1031).

23 Montaigne 1991, ‘An apology for Raymond Sebond’, Bk II, §12 (505).

24 Eg, letter of Nicholas Schönberg, Cardinal of Capua, to Copernicus, 1 November 1536: ‘Some years ago word reached me concerning your proficiency, of which everybody constantly spoke. At that time I began to have a very high regard for you, and also to congratulate our contemporaries among whom you enjoyed such great prestige. For I had learned that you had not merely mastered the discoveries of the ancient astronomers uncommonly well but had also formulated a new cosmology. In it you maintain that the earth moves; that the sun occupies the lowest, and thus the central, place in the universe; that the eighth heaven remains perpetually motionless and fixed; and that, together with the elements included in its sphere, the moon, situated between the heavens of Mars and Venus, revolves around the sun in the period of a year. I have also learned that you have written an exposition of this whole system of astronomy, and have computed the planetary motions and set them down in tables, to the greatest admiration of all. Therefore with the utmost earnestness I entreat you, most learned sir, unless I inconvenience you, to communicate this discovery of yours to scholars, and at the earliest possible moment to send me your writings on the sphere of the universe together with the tables and whatever else you have that is relevant to this subject’: Copernicus 1992.

25 Freely 2014 (105–6).

26 Ronchi 2014 (47).

27 This is clearly shown in Finocchiaro’s reconstruction of the accusations against Bruno (2002); see also Blumenberg 1987.

28 Barber 1961 (596): ‘In the study of the history and sociology of science there has been a relative lack of attention to one of the interesting aspects of the social process of discovery – the resistance on the part of scientists themselves to scientific discovery ... There has been a great deal of attention paid to resistance on the part of economic, technological, religious, and ideological elements and groups outside science itself. Indeed, the tendency of such elements to resist seems sometimes to be emphasized disproportionately as against the support which they also give to science. In the matter of religion, for example, are we not all a little too much aware that religion has resisted scientific discovery, not enough aware of the large support it has given to Western science?’

29 Wilkins 2012.

30 In a YouGov Poll in 2017, 84% of those who identified as religious/spiritual in the UK rejected creationism (rejected by 92% of the population overall). Slightly confusingly, 3% of the non-religious and non-spiritual nonetheless believed in creationism, and a further 7% of that same group believed in evolution ‘guided by God’. The report’s authors conclude that ‘individuals who find it difficult to accept aspects of evolutionary science overwhelmingly see other sciences as reliable, showing similar trends in attitudes as other groups. Rejection of, or uncertainty about, aspects of

human evolution is not necessarily an issue of “religion versus evolutionary science”. Universal questions around what it is to be human and about the human experience are implicated in this rejection or uncertainty and affect people of all faiths and none’. See <https://scienceligionsspectrum.org/in-the-news/press-release-results-of-major-new-survey-on-evolution/> (accessed 15 March 2021).

31 Letter of Darwin to Asa Gray, dated 22 May 1860; in F Darwin 1887, vol 2 (312).

32 Letter of Darwin to John Fordyce, dated 7 May 1879; in F Darwin 1887, vol 1 (304).

33 Fowler 1981; Oser 1991; Tamminen 1994.

34 See Robinson 1983; Hart & Ailoe 2007; Coles 1990; Stower & Ryan 1998.

35 Evans 2000 & 2001; Barrett & Richert 2003; Bering 2004; Kelemen 2004; Kelemen, Callanan, Casler *et al* 2005; Richert & Barrett 2006; Bloom 2007.

36 Evans 2000 & 2001.

37 Kelemen 2004; Kelemen *et al*, *op cit*.

38 Nye 1998.

39 Hay 2007 (14).

40 Hay & Nye 2006.

41 Marshall 2005 (324).

42 Fingelkurts & Fingelkurts 2009.

43 In this connection, see Moreira-Almeida & Cardeña 2011. They find that abnormal religious experiences are distinguished from psychotic illness by being ‘related to higher levels of spirituality and better mental health, social adjustment, and well-being, rather than to pathology’. Such experiences do not lead to disturbance or suffering, are not associated with social or occupational impediments, involve insight, are compatible with religious traditions, lack psychiatric co-morbidity, and are experienced as leading to personal growth, self-integration and helping others.

44 Saver & Rabin 1997.

45 Hood, Hill & Spilka 2009.

46 Katz 1971.

47 Hart 2013 (84).

48 Blake, ‘Auguries of Innocence’; and ‘A Vision of the Last Judgment’.

49 Griffiths, Hurwitz, Davis *et al* 2019.

50 Newberg & d’Aquili 1994; Newberg, d’Aquili & Rause 2001; Newberg, Alavi, Baime *et al* 2001; and Newberg & Lee 2005.

51 Newberg & Lee *op cit*.

52 Uebersax 2013.

53 Drob 1997.

54 Norenzayan & Gervais 2013.

55 See eg, Norris & Inglehart 2004.

56 But this very incapacity can drive such people into the open arms of demonstratively welcoming religious communities.

57 McCauley 2011 (253–4).

58 Norenzayan, Gervais & Trzesniewski 2012.

- 59** Caldwell-Harris, Murphy, Velazquez *et al* 2011.
- 60** Bering 2002.
- 61** Silver, Coleman, Hood *et al* 2014.
- 62** *ibid.*
- 63** See Gervais & Norenzayan 2012; Pennycook, Cheyne, Seli *et al* 2012.
- 64** Shenhav, Rand & Greene 2012.
- 65** Waller, Kojetin, Bouchard *et al* 1990; D’Onofrio, Eaves, Murrelle *et al* 1999; Eaves 2004; Eaves, Martin & Heath 1990.
- 66** Bouchard, Lykken, McGue *et al* 1990.
- 67** Zuckerman, Silberman & Hall 2013.
- 68** Peirce 1931–60, vol 8 (262).
- 69** Rée 2019.
- 70** Joseph 2001.
- 71** Sosis 2000; Sosis & Bressler 2003.
- 72** Alimujiang, Wiensch, Boss *et al* 2019. See also the meta-analysis of Cohen, Bavishi & Rozanski 2016; as well as Hill & Turiano 2014; Krause 2009; Boyle, Barnes, Buchman *et al* 2009; Gruenewald, Karlamangla, Greendale *et al* 2007; Sone, Nakaya, Ohmori *et al* 2008; Tanno, Sakata, Ohsawa *et al* 2009; Okamoto & Tanaka 2004; Nakanishi, Fukuda & Tatara 2003.
- 73** Koenig, King & Carson 2012.
- 74** See also van Praag 2009.
- 75** Smith & Denton 2005 (218–19).
- 76** Johnson, Li, Larson *et al* 2000.
- 77** See also Cook, Goddard & Westall 1997.
- 78** For this and the previous two paragraphs, see Koenig, King & Carson 2012.
- 79** Powell, Shahabi & Thoresen 2003; McCullough, Hoyt, Larson *et al* 2000; Chida, Steptoe & Powell 2009; Koenig 2012; McCullough 2001.
- 80** Chida *et al*, *op cit.*
- 81** In this connection, see, eg, Orr, Tobin, Carey *et al* 2019.
- 82** Putnam 2000.
- 83** Sturm, Datta, Roy *et al* 2020.
- 84** Abu-Rayya, Abu-Rayya & Khalil 2009.
- 85** Rosmarin, Pirutinsky, Pargament *et al* 2009.
- 86** Tarakeshwar, Pargament & Mahoney 2003.
- 87** Graham & Crown 2014.
- 88** See eg Okruszek, Kalinowski & Talarowska 2013.

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ABOUT THE AUTHOR



Dr Iain McGilchrist is a psychiatrist, neuroscience researcher, philosopher and literary scholar. He is a Quondam Fellow of All Souls College, Oxford, an Associate Fellow of Green Templeton College, Oxford, a Fellow of the Royal College of Psychiatrists, and former Consultant Psychiatrist and Clinical Director at the Bethlem Royal & Maudsley Hospital, London. He has been a Research Fellow in neuroimaging at Johns Hopkins Hospital, Baltimore and a Fellow of the Institute of Advanced Studies in Stellenbosch. He has published original articles and research papers in a wide range of publications on topics in literature, philosophy, medicine and psychiatry. He is the author of a number of books, but is best-known for *The Master and his Emissary: The Divided Brain and the Making of the Western World* (Yale 2009). He lives on the Isle of Skye, has two daughters and a son, and now grandchildren.



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